RAILROAD GAZETTE

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Contributions.

Rail Making in England.

Los Angeles Terminal Railway.
ST. LOUIS, MO., October 26, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I read with much interest the article of Mr. Hunt in last week's issue (Oct. 18) in regard to rail specifications. It is pleasing to note that the manufacturers of rails in this country are recognizing the fact that a better rail can be made than has been made in the past. It is a recognized fact that rails of heavy section of recent manufacture are wearing out almost as fast as the old iron rails did. Not long since when riding on the rear of a train on a railroad out of New York, where the 100 lb. section is used, I could notice as the light struck the rails that they were beginning to show decided marks of wear.

While in England the past summer I was interested in obtaining what information I could of the manufacture of rails, for I then believed, as I do now, there has been more care taken to make a rail in England than our railroads require. I saw rails long in use where the traffic is the heaviest in England and where the load is not so much lighter when taking into consideration the tonnage passing over it, that the argument could not be used, that their rails do not have to hold up anything.

The London & North Western Railway make their own rails, and I was unable to obtain much detailed information as to specifications. The largest purchaser of rails in the English market is, I believe, the Indian Government. I am pleased to be able to enclose you a specification for their steel rails, 75-lb. section. Comparing these specifications with our American standards, one will notice that that they put a very considerable stress on what might be called the physical test; paragraph 1 of section 11 is, I believe, not in use with us. The analysis of the rails is not conspicuously different from our present ideas, and, in fact, is quite similar to that suggested by Mr. Hunt. I am pleased to send you also an extract from a letter of the Engineer of Maintenance of Way, Lancashire & Yorkshire, in which he says: "A rail with a proportion of carbon of 0.3 to 0.4 per cent., giving a tensile strain of 40,000 lbs. to the square inch, would meet all requirements. Under such conditions a test piece 5 ft. long, cut from any rail, may, at a span of 3 ft. 6 in., with a weight of one ton falling 20 ft., giving it a deflection not less than 2½ in., and afterward being reversed with the same weight, fall and span, be knocked almost straight again. The rail must not break or show any signs of fracture under the first test."

Personally, I cannot but believe but that in England a better rail is made of the same section than we make, and one which will last much longer under heavy traffic. I am open to conviction and would be pleased to say that I am mistaken.

GEO. B. LEIGHTON.

RAIL SPECIFICATIONS OF THE INDIAN STATE RAILWAYS.

Contract for permanent way materials. Steel flat footed rails, 75 lbs. per yard, with foot 4 inches wide (new standard).

1. The work required under this specification consists of the manufacture, supply and delivery, at one or more of the ports named in the conditions and tender, of steel flat-footed rails, as per schedule attached.

2. Templates of the rail will be furnished to the contractor, upon application to the consulting engineer, from which he must make three sets of well-finished brass templates (male and female).

These templates must be submitted to the consulting engineer, and approved by him before the general manufacture of the rails is commenced. Two sets of templates are to be considered the property of the Government of India, and must be neatly engraved with the words "Indian State Railways, N.S. 75 lbs., foot 4 inches," the number of the contract, the contractor's name, and date of order.

3. After these templates have been approved, a sample piece of rail 12 inches long must be submitted to the consulting engineer and approved by him in writing before the general rolling of the rails is commenced.

4. The rails are to be made from a mixture of best English or Spanish hematite pig iron and charcoal Spiegeleisen. The iron is to be melted in air furnaces or cupolas before being run into the converters, and the steel cast into ingots of such weights as will produce one or more blooms, each capable of being formed into one or more rails of the full weight after cropping.

5. The whole of the rails must be of uniform section throughout, true to template perfectly sound and straight, and free from splits, cracks, scoriæ and defects of every kind. Any rails which are bent or warped in the manufacture must be straightened by pressure and not by hammering. The ends must be cut true and square, and the burrs caused by the saw are to be carefully removed.

6. The rails are to be accurately rolled to the approved template, their weight being as nearly as possible 75 lbs. per yard. No rail more than 1 per cent. above or below the weight due to the section will be accepted, and no payment will be made for any weight in excess of the estimated weight; should the weight fall below that due to the section, a proportionate deduction will be made from the contract amount.

7. The length of the rails is to be 30 ft., but a quantity, not more than 4 per cent. of the whole, 27 ft. in length, and 2 per cent., 24 ft. in length, will be accepted. The shorter lengths may be cut while cold from longer rails found to be defective at the ends. No rebeating of the rails will be permitted. No rail the length of which is more than ⅛ in. above or below the specified lengths will be accepted.

8. Two bolt holes, 1⅝ of an inch in diameter, for the fish bolts, must be drilled through the web at each end of the rails. The holes must be drilled clean, and square with the web without burrs on either side, and accurately placed in the positions shown on the annexed lithograph. The holes must correspond exactly with gages to be furnished by the contractor and approved by the consulting engineer or his deputy, and any variation of more than ⅛ of an inch from such position in any direction, or from the correct size of the hole, will render the rails affected liable to rejection. The holes are not to be punched before being drilled.

9. One side of every rail is to have distinctly rolled on it the letters [see schedule] "75 lbs., N. S., 4 in.," the maker's name and the year of manufacture.

10. Every cast of steel from which the rails are to be manufactured must be analyzed by the contractor for carbon and phosphorus; should the carbon be less than .3 per cent. or more than .45 per cent., or should the phosphorus, including arsenic, exceed .06 per cent., the cast is not to be used.

On the day on which the analyses have been determined, an authenticated copy of the results must be sent to the consulting engineer.

Further a piece of one rail out of every batch of 500 tons will be subjected to complete chemical analysis from time to time.

These pieces of rail must on analysis comply with the following conditions:

The quantity of carbon must not be less than			.....	.3 per cent.
" " " " "	more than		..	.45 "
" " " silicon " "	"		....	.06 "
" " " phosphorus and arsenic together must not be more than			.....	.06 "
" " " sulphur must not be more than			..	.06 "

Should any piece of rail analyzed not comply with these conditions, the whole batch of 500 tons to which it belongs will be subject to rejection, if the consulting engineer shall so decide.

The analyses of the rails are to be performed by a metallurgist to be appointed by the consulting engineer, and from his analysis there shall be no appeal.

11. The rails will be tested on the contractor's works, as follows:

1st. A rail 30 ft. long will be placed on iron bearings 3 ft. 6 in. apart in the clear, and equidistant from its ends, and a weight of 28 tons will be suspended from the center of the rail. The deflection under this weight, measured on the distance between the centers of the bearings, must not exceed 9/16ths of an inch after the weight has been on the rail half an hour. No permanent set must appear upon the removal of the load.

2d. The same rail will be supported as before, and a cast iron monkey, weighing one ton, will be allowed to fall freely upon the center of the rail from a height of 20 ft.; the rail must bear two such blows without showing the least sign of fracture. The permanent set caused by the first blow must not exceed 2½ in. The total deflection of the rail, measured on the distance between the centers of the bearings, after the second blow has been given, must not exceed 5 in.

3d. The rail is then to be broken through by further blows, when it must show a perfectly sound and homogeneous fracture of such a character as shall be satisfactory to the consulting engineer.

One rail in every 100 manufactured will be thus tested, and if it shall fail to comply with any of the above-named tests the cast to which it belongs will be rejected, for which purpose every rail must have stamped upon it at both ends the number of the cast.

The apparatus for testing the rails must be erected by the contractor on his works, at his own cost. Its position, foundation and construction, and the method of testing, are to be in all respects such as shall satisfy the consulting engineer, and all cost attendant on its use, as well as the loss on the rails tested, must be borne by the contractor. The bearings for the rails must, for the falling test, be bedded on a block of oak timber, 18 in. square, which is to be laid on a bed of gravel 2 ft. thick, and the bottom of the monkey must be cast to a radius not exceeding 12 in.; the weight must be lifted by steam or hydraulic power. Rails which would be rejected for defects may be used by the contractor, if he thinks fit to do so, for testing.

12. Before the rails are put before the inspector, they must be properly looked over by the contractor's men, and all rails which the contractor would admit to be defective are to be sorted out, and placed in a separate stack. No rail is to be considered ready for delivery until it has been inspected and approved. The contractor must provide, free of charge, all tools and labor required by the consulting engineer for the inspection and whatever testing of the work may be carried out on the contractor's premises. The cost of all analyses and tests will be borne as provided for in the conditions of contract. The consulting engineer or his deputy is to have the power of stamping, in some easily distinguishable manner, all rejected rails, but they will not be marked in such a manner as to render them unsalable to other parties. The rails tested at the works are not to be delivered as part of the contract.

Note.—Parties tendering are at liberty to name a price for these rails manufactured from steel made with other materials than those specified, but a full description of the material and process they propose to adopt must in this case be inserted at the foot of their tender.

The Philadelphia & Columbia Track.

NO. 18 BROADWAY, NEW YORK, Oct. 29, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I am informed by Mr. W. Hasell Wilson that the tracks on the inclined plane of the old Columbia Railroad, and extending westward six miles, were laid with granite sills plated with flat iron bars, and he suggests that the granite pedestals which I described in my recent note to you [Oct. 25] were the supports of the rollers upon which the cable rested and not for the track as I had supposed. He also states that no cast iron rails were used upon the inclined plane or elsewhere upon the road. Mr. Wilson, having been the engineer of the eastern 40 miles of the road, the track was laid under his direction and there can be no higher authority.

In his letter to me he gives the following interesting details: "A few miles of track were laid as an experiment with granite sills plated with flat iron bars, similar to the Baltimore & Ohio plan; about 18 miles were laid with cross-ties and rails of wood plated with flat iron bars, to expedite the opening of the road; the remainder of the track was composed of rolled iron edge rails (with top and bottom surfaces parallel) resting in cast-iron chairs, secured to stone blocks which were about 18 in. square by 1 ft. in depth. On the section between Broad street and the Schuylkill, on a portion of the track, granite cross sills were placed at the joints 15 or 18 ft. apart, according to the length of the rails; on the remainder of the road wooden cross-ties were used at every 9 ft., the rails being laid to break joints. The first order for rails called for 15-ft. lengths; subsequently they were 18 ft. No other description of rails than above described were used on the road.

"Cast-iron rollers were placed in the middle of the tracks on the inclined plane to support the cable. They rested on stone blocks, but as the work connected with the machinery for operating the plane was under the immediate care of a machinest, I did not give very close attention to the details. No other cast-iron than what was required in the machinery was used in or about the plane. I think that the iron and blocks alluded to by you must have been for the rollers."

A description of the Philadelphia & Columbia Railroad can be found in Mr. Wilson's valuable "Review of the History of Railroads."

FOSTER CROWELL.

Steam and Trolley in Connecticut.

BY CLARENCE DEMING.

The statistics of steam railroads in Connecticut which have a total single trackage of 2,583 miles bring out the suggestive fact that, apart from additional trackage of old lines and new sidings, less than 75 miles of new track have been laid in the state since 1875. In other words, twenty years ago steam railroad enterprise in the state had, in effect, exhausted itself territorially, and population was left to expand along a system of railroads most of them already old. This fact is a forceful one to explain the remarkable centralities of population in a state where about half the people, out of a total of some 820,000, dwell along the main stem of the New York, New Haven & Hartford (The "Consolidated") railroad between Hartford and Greenwich, both inclusive, while at the same time large areas are void of railroads and on the down grade both in population and prosperity. On the map three such areas can be seen in the eastern half of the state, each almost as large as some of the Connecticut counties. They and the groupings of the railroad lines themselves show how it has come to pass that eighteen cities and the same number of borough towns, each touched by one or more railroads, have absorbed about 75 per cent. of the population in a commonwealth containing 168 townships; and also how, in populations so condensed, electric rivalry with steam has found a most alluring field.

A special factor in the Consolidated railroad system which has tempted that electric rivalry has been the large ratio of the company's passenger business. In its earlier and partly during its later history freight business was relatively ignored and left to the Sound boat lines. Not many years have gone by since a President of the New Haven Company expressed himself in scornful terms of the "dead" freight traffic in contrast with the freight which "handled itself"; and still fewer years have lapsed since at so important a business point as New Haven a placard at the company's freight shed was big lettered with the words, "No freight received after 4 o'clock p. m." Ten years ago the receipts of the company were from freight, $2,783,188; from passengers, $4,506,455. The end of the ten years, which, with the immense growth of the system and the absorption of roads, many of them freight carriers, have more than quadrupled receipts, still show great ratios of passenger traffic, and, spite of the remarkable results of expanding the Harlem freight terminal, receipts from passengers last year were $13,583,294 as compared with $11,896,695 from freight. How such a huge traffic in passengers, much of it local, has attracted the syndicates and other electric road promoters into the hope not merely of securing a large fraction of it, but of an ultimate and profitable "strike" against one of the most prosperous steam railroad corporations in the world, goes with the mere statement of the conditions.

A little more than five years ago the first clumsy experiments with the trolley began on two or three minor roads in the state. The new motors drew little attention save as curiosities, were essentially failures, and not until better trolley equipment of some of the old street railroads did they attract the languid notice of the steam companies. The latter, indeed, remained strangely passive toward the new motive power until the period of extending the old street railroads began late in 1890, and then they woke up with a start. Since that time there has been until lately almost incessant conflict, modified somewhat by the political deadlock of the legislature of 1891, but waged bitterly in both legislatures since, as well as in the courts and to some extent in the municipal governments. In the legislature of 1893 the battle on the whole was a drawn one, the general street railroad law passed in that year, however, slightly favoring the trolley on streets. But the steam companies massed their forces in the legislature of 1895, crushed out scheme after scheme of the new trolley companies and secured a ruling in committee which applied to trolley companies owing their own roadbed, the sharp

checks of the general steam railroad law passed 20 years ago. Should that ruling hereafter be held by the courts also, the trolley companies must hereafter confront the rising sentiment of the people against surrender of highways, on the one hand, and, on the other hand, a statute almost prohibitory on electric companies seeking their own roadways. The ruling appears to be technically correct and accords with the letter of the law of 1893, which applies only to "street" railroads—the possibility of independent roadbeds not then being foreseen. But it is by no means impossible that the courts may reject so drastic an interpretation or the next legislature amend the law so as to expunge a technicality which is quite out of key with the real aim of the statute.

A law passed by the last Connecticut Legislature absolutely prohibiting crossing at grade by steam and electric roads was another reverse of trolley enterprise which checks extension and at a number of points in the state severs electric systems so that passengers must pass the gaps on foot.

That, and other Legislative defeats, together with a decision of the courts against a parallel scheme, have almost blocked for awhile trolley expansion in the state and at the present time hardly a single electric road is building. But the expansion during 1893, 1894 and the earlier months of the present year was enormous, chiefly under charters much too liberal obtained from the legislature of 1893. The figures during that brief period of about two years and a half show an increase of about 100 per cent. in single track mileage of street railroads (all of them now trolleys), swift consolidation of both old and new street railroad properties, a paralleling of steam roads—by old and new street companies combined—of about 91 miles and many plans for extension. There has also been, in general, a remarkable growth of trolley business, the increase of summer excursion traffic and of the use of the trolleys for recreation being especially marked. A Connecticut phrase "the trolleys pick up passengers under the bushes" is more than metaphor.

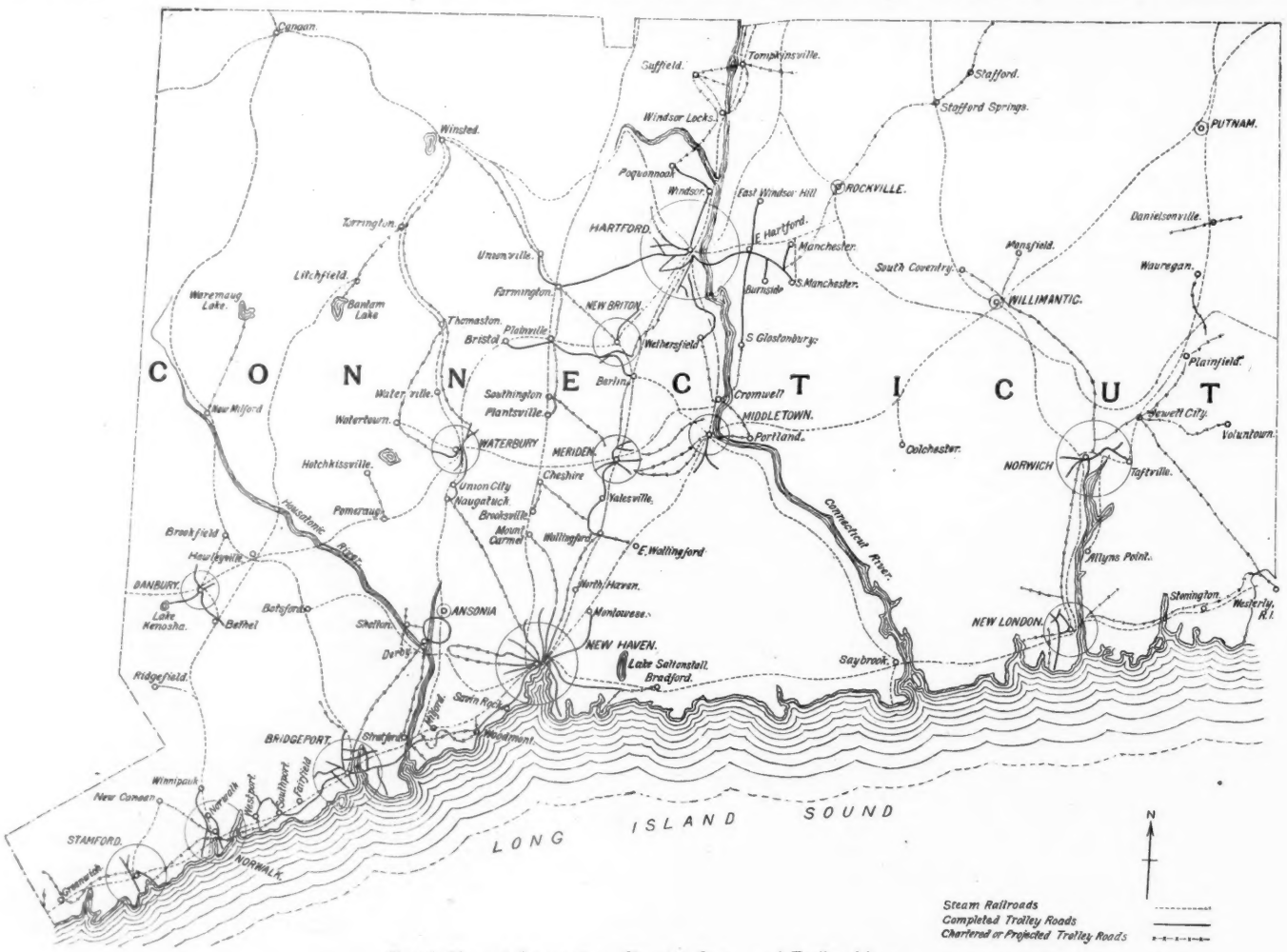
Losses by trolley competition on the New England and Connecticut steam lines other than the Consolidated have not been published. But at a legislative committee hearing several months ago, the officers of the Consolidated Company presented statistics of loss during different fractions of a year on the 35 miles of their system paralleled by Connecticut trolleys. The figures were offered first in the deceptive form of percentages, then in the scarcely less misleading shape of "number of passengers"—conveying thus an exaggerated idea of loss as the passengers were carried very short distances. With the ratios carried out for a whole year and the totals reduced to money the trifling loss appeared of but $32,461. This in itself was not alarming and an increase from 1894 to 1895 on the whole Consolidated system of passenger mileage from 725,250,169 to 747,008,728, with no important extension of the steam company's lines, goes also to prove that trolley competition has been far from deadly. Still it contains elements to give the powerful corporation grave concern. Notwithstanding the increase of passenger mileage there was a decrease of passengers for 1895 as compared with 1894, from 44,448,324 to 43,828,676, the average distance carried rising from 16.32 miles to 17.04 miles—both undoubtedly the effect of the competitive trolley. Moreover, while a considerable loss has been caused by the trolley equipment of old parallel lines it has had small ratio to the loss where new trolley parallels have been constructed, these, in a number of cases, sweeping away from three-quarters to almost nine-tenths of the local steam passenger traffic between the competing points. In this was an alarming hint of the potential consequences of new trolley parallels however plausibly it might be urged that new trolley lines as laterals might offset the loss, and that the trolleys would, as a rule, affect seriously proximate rather than intermediate stations. A new motive power which, even at a few new points of competition, could all but destroy local passenger traffic on the steam road, was a thing to be feared as a speculative mystery, if nothing else.

Partly as a result of that apprehension, partly in consequence of the success of the Nantasket Beach experiment, the Consolidated managers have now disclosed a new plan of campaign, supplementing their tactics in legislatures and courts. A physical policy has for the time superseded the work of lobbyist and attorney. It can be best set forth by a sketch of the railroad strategy which has for its base of operations the city of Meriden.

That city, situated not far from the geographical center of the state, has a present population of about 28,500, and a trolley system some 17 miles long in single trackage, reaching southward to Wallingford, and closely paralleling the main stem of the Consolidated Company. Meriden it about 18 miles away, in opposite directions from New Haven, with a population of about 100,000, and Hartford with a population of about 62,000. Within a maximum radius of about 12 miles are Wallingford, with a population of 7,000; New Britain with a population of about 22,000 and a trolley line reaching already to Berlin, only 8 miles north of Meriden; Southington, with a population of 5,500 and a short trolley road; Waterbury with 38,000 people and a trolley system with 12 miles single trackage, and Middletown with a population of about 17,000 and a small trolley system—in all a population of about 118,000 within the stated radius, not counting several minor places or New Haven and Hartford. Meriden is also near the midway point of the Waterbury, Meriden & Cromwell steam road formerly leased to the New England, but which the receivers of the latter company decided to let drop. It is now well nigh certain that the Consolidated company has not only bought up a block of bonds which, by foreclosure will control the Waterbury, Meriden & Cromwell line, but has also purchased the trolley system of Meriden. It means almost beyond question, in the near future the operation of the acquired steam road by electricity in conjunction with the Meriden trolley system, the plan requiring but a single power house at Meriden and another at Waterbury. How effectively the step breaks any electric parallel scheme on the important section of the Consolidated system which lies between New Haven and Hartford, a glance at the map will demonstrate.

The Meriden plan of the Consolidated Company joined with its recent purchase of the Stamford Street Railroad System—also with the New Canaan branch to be operated in conjunction—outlines with considerable clearness the policy of the great steam corporation. That policy may be forecast briefly as the acquisition of any trolley roads where the purchase will break threatened extensive parallels and at the same time allow economies by uniting in operation by a single power-house branch lines equipped electrically together with the trolley system bought up. Obviously one of the next salient points in the state is Waterbury where the threatened parallel in the Naugatuck Valley with its long series of busting factory towns can be severed and the Watertown branch operated also by electricity. The New Britain and Middletown branches, the Rockville branch of the New England, the branches to South Manchester—a quasi private line—the Suffield branch and others will suggest themselves as open to the same policy. Larger developments, such as applications of electricity to the main stem or the proposed electrical equipment of two of the four tracks to enter Boston so as to make a suburban trolley service, are more speculative and exceed the scope of this article. Suffice it to say that one of the leading officers of the Consolidated Company goes so far as to predict the time not very far away when practically the whole electric system of the state in cities will be acquired by his company and utilized not merely in the passenger service, but the freight service also—the latter already gravely complicated in the larger cities by lack of room and its high cost, original and in interest, while loaded cars await delivery.

As fighting ground of steam and trolley during two sharp campaigns and others, doubtless, to come after the present armistice, Connecticut offers a suggestive field for speculative queries, among them these: Will the Consolidated Company, now a completed and proclaimed



Sketch Map of Connecticut, Showing Steam and Trolley Lines.

NOTE.—Connecticut has an area of 5,004 square miles. Population by last census 746,258, now about 820,000. Its surface is rolling for a distance from the coast of about ten miles inland, hilly in the central regions rising to higher hills in the northeast and small mountains in the northwest. Its completed trolley roads have a single trackage of almost 300 miles, and the roads "chartered or projected" of which comparatively few are likely to be built, reach not less than 500 miles more, not including those projected in cities. The stock issued on completed trolley roads is about $9,000,000, of which a very large part has never been paid in as cash; the bonded debt is about $7,000,000; the floating debt can only be guessed at.

On the map the region around the cities is presented on an enlarged scale necessarily distorting the distances in the neighborhood, but depicting somewhat the trolley systems within city limits. In Connecticut all the steam railroads are now owned or controlled by the New York, New Haven & Hartford Railroad Company except the New London Northern running on the map from New London to the northern State line by way of Norwich and Willimantic; the Philadelphia, Reading & New England running northwestward from Hartford to the State line by way of Winsted and Canaan; and the South Manchester branch line. The New Haven Company's lines alone bisect about 130 out of 168 townships in the State, suggesting its power over the legislature.

monopoly, be able to retain its old dominance in Connecticut legislation? Will the trolley companies, under a modified general law and owning their roadways, with large latitude for speed, be able to force upon the steam monopoly far graver problems than any which have yet beset it? Will the policy of purchase of trolleys by the steam corporation be restricted or extended and will or will it not invite new trolley enterprise, with a "strike" as its ultimate effect? And will the trolleys, as laterals and feeders, ultimately offset or not their more immediate effects as parallels and competitors?

This last query may in part be answered here. Experience in the case of the Consolidated has shown that to some degree the competing trolley parallels feed some passengers to the steam road going to stations beyond the trolley terminals and that the number of those passengers tends to increase. A person living midway beween stations A. and B. of the steam road as competing points obtains new facilities for travel to remoter points; and such a passenger does not appear in any statistics of loss between the two stations. As laterals to the steam road the trolleys have already proved to be somewhat the same as an actual increase of population in its relation to passenger traffic. But whether these two offsets will make good the direct and immediate loss by trolley competition time only will disclose.

The trolley companies of the state also have their threatening obstacles ahead in the growing tendency toward local taxation, a waxing sentiment against their occupancy of rural highways and a possibility by no means remote that they may be forced to put their wires underground. But all these future perils of the Connecticut trolley are minor as compared with its danger from rulings of the state courts on the question of added servitude upon the highway and the consequential right of the abutting land owner to damages.

This subject deserves its brief review. In Connecticut, as in many states, it is still a case in transition. There happen to be two, and only two, decisions of the state courts bearing directly on the subject and opposed to each other in temper and ruling. The first is that in the case of Imlay vs. The Union Branch Railroad Company (26 Conn., 249) in which a steam company sought occupation of a Hartford City street. The suit, 38 years ago, was an amicable one, and the Supreme Court Judges all concurred in the decision which was written by Chief Justice Storrs, one of the brightest lights of the Connecticut bench. The tribunal found against the company, a fact of less import than the principles laid down in the finding. The judge held that there was no identity between railroad and highway; that the contrary view would lead to the conclusion that a broad street might be partly made into a canal if only passing way were left for pedestrians and vehicles; that the latter construction would also imply that a railroad could continue, without paying damages, to occupy the highway after it had been discontinued as such; that the fundamental principle to guide in the case was that the user of the highway should leave it unobstructed and in the same condition after passage as before. On these grounds, and others not bearing so closely on later aspects of the question, the Court declared that the railroad constituted an additional servitude entitling the abutting land-owner to compensation for damages.

Eight years later, in 1865, came the individual decision of Judge Ellsworth of the Supreme Court in Elliot vs. Fair Haven & Westville Horse Railroad Company (32 Conn., 579) the judge presiding in the Superior Court, a lower tribunal. He held sweepingly in direct contravention of Storrs and his colleagues that the existing servitude embraced "all public travel not prohibited by law, on foot, carriages, omnibuses, stages, sleighs and other vehicles as the wants and habits of the public demand," and that the absolute power to regulate such traffic vested in the legislature. He found therefore that the use of the highway for horse cars—which he classed as a kind of omnibus on rails—created no new servitude, but was a part of the public use to which the land was subjected when originally taken as a highway. His opinion, while far less copious in citation of authorities than that of Judge Storrs, and treating with much less fullness and force the principles involved, has become the rule of law in determining the status of horse railroads. But in Connecticut it leaves the question of the trolley, with its overhead structure, its increased speed, larger cars and greater obstruction of the highways still pending, though a matter which the Connecticut Supreme Court, after approaching the subject already in two or three cases, must soon pass upon. In the words of the last report of the Connecticut Railroad Commission: "The final decision will depend on whether the courts follow and accept the reasoning of Chief Justice Storrs in the one case or of Judge Ellsworth in the other." The first of these decisions was rendered in 1857, the second in 1865, and both judges have been long dead. It will be a curious outcome if the decision of the momentous question fixes the added servitude after the Consolidated Company acquires many electric lines, and thus is compelled to assume double servitude.

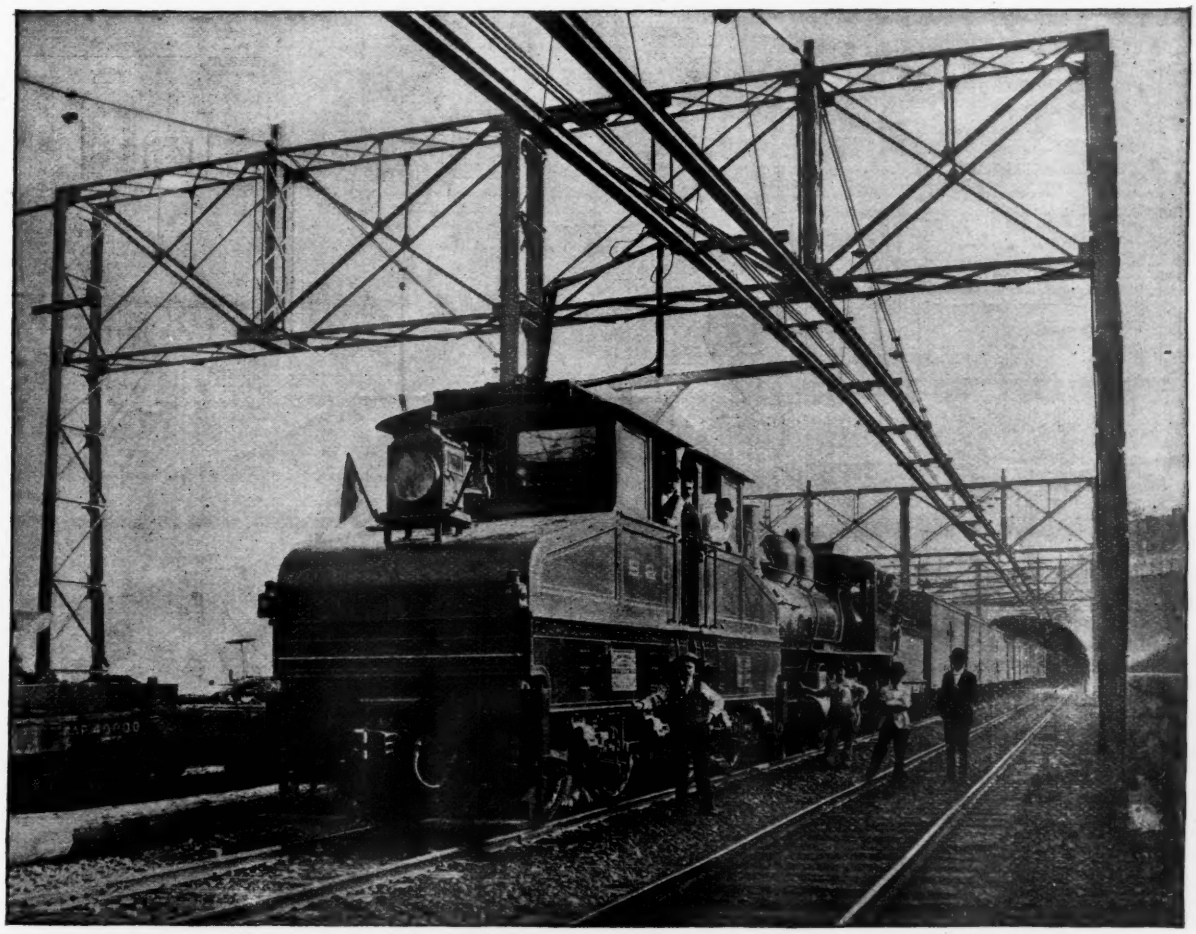
Not all the problems forced on the people of Connecticut pertain to the carrying trade and its rivalries, to finance, to economics and to state legislation. There are not a few political and civic ones expressed in terms of corruption of municipal bodies, and accented at the present time by an investigation in Bridgeport, where a committee of inquiry, seeking light on the charge that the local trolley company has violated specifications, is thwarted by the plea that past city officers have in form of law accepted work both illegal and bad. Not entirely illogical is the phrase of a prominent citizen of the state, who announcing his conversion to city ownership of trolleys, declares it merely a question of "city ownership of trolleys or trolley ownership of cities." Peculiarly interesting, too, is the query what readjustment of population the trolleys are to bring in a state where the drift of rural population to cities has been so singularly marked, where the farm life has decayed and the old yeoman spirit has died out. Will the trolley repopulate the farms by making them more accessible, or will they depopulate them still more by bringing the allurements of the city nearer? Will they ruralize the city or urbanize the country with all the social, civic and moral recastings which those processes suggest and imply? These are large subjects on which many words may be penned, but not here.

The B. & O. Electric Locomotive.

The following information concerning the performance of the electric locomotive now in use on the Baltimore & Ohio tunnel under the city of Baltimore, has been furnished us by the General Electric Company, which built the engine:

The 96-ton electric locomotive has now been in operation on the Belt line of the Baltimore & Ohio since Aug. 4 last, hauling the entire northbound freight service of that road through the tunnel. Every train has been handled promptly, and the locomotive has been ready at any and all hours during the day, causing no delay to traffic.

A few weeks ago a test was made to learn its capacity for hauling a loaded train on an up grade. For this purpose a train consisting of two steam locomotives, not working, and 27 loaded freight cars, was brought to a stop while going north through the tunnel. Here the grade is 42 ft. to the mile, the rails being damp and greasy. The weight of the train alone was 1,125 tons, or 1,221 including the electric locomotive. Every drawbar was tight, no slack occurring throughout the length of the train. In this condition current was turned into the motors and movement was immediately communicated to the train. At the end of one minute, the train was moving at a speed of 10.5 miles an hour, and at this point the speed was increased to the usual rate. The total distance moved in 40 seconds was 150 ft. and at the expiration of one minute 450 ft.



The B. & O. Electric Locomotive Hauling a Freight Train Through the Belt Line Tunnel.

A few days ago a test was made with a dynamometer car placed between the electric locomotive and a train, consisting of 22 cars loaded with coal, one caboose and two dead locomotives. The total weight was 1,068 tons. On the grade in the tunnel an average drawbar pull of some 25,000 lbs. was obtained from the dynamometer diagram. The speed at this point was 11⅛ miles per hour. Comparison with the diagrams obtained in similar service with steam locomotives showed a remarkably uniform and steady pull by the electric engine, due to the absence from it of reciprocating parts, the torque being constant throughout the entire revolution of the wheel. As the capacity of the dynamometer car was only 26,000 lbs., when accelerating the train the drawbar of the car came up against the safety stops.

A further test was made with another train, consisting of 36 cars, one caboose and three dead engines. This was a regular through freight train with a local freight attached, and the total weight was over 1,600 tons. It was hauled with ease through the tunnel and calculation from the previous dynamometer records and the drawbar pull per ampere, showed a drawbar pull of over 45,100 lbs.

A test made on Oct. 6 has added a new record to the list of performances of this locomotive. The character of the test is heightened by the fact that the train which

it moved was over 1,800 ft. long and weighed about 1,900 tons and was started from rest in the tunnel. It consisted of a northbound freight train of 28 loaded cars and two locomotives coupled to a local freight of 15 loaded cars and one locomotive. In starting, not a sputter, spark or slip of the wheel occurred, and the train moved with the same precision as if the train had been of the ordinary weight. The drawbar pull of 60,000 lbs. was about the record in this case. The train was quickly brought to a speed of 12 miles an hour and pulled through the tunnel without difficulty with the locomotive continuously exerting a drawbar pull of 40,000 lbs.

Up to the present time no train which would hold together has been found heavy enough to cause the electric locomotive to slip its wheels under ordinary fair conditions. The capacity of the locomotive has been by no means reached, the tests having only shown approximately what it can do. A dynamometer car of sufficient capacity to test the maximum drawbar pull will shortly be secured, when definite figures can be obtained.

An extension of the overhead work of the electric equipment, north to Waverly, is being planned by the B. & O. The extension would secure the services of the electric locomotive on the grade from North avenue. It is also contemplated to build south to Baylies, where housing for the electric locomotives will be built. The one now in use is at present side-tracked in the open air when not making runs.

The two additional machines ordered are nearing completion at the works of the General Electric Company at Schenectady, and when finished the passenger service through the tunnel will be undertaken by them. Our illustration shows the electric locomotive coupled to a northbound freight train issuing from the tunnel.

A Richmond Ten-wheel Compound for the Chesapeake & Ohio.

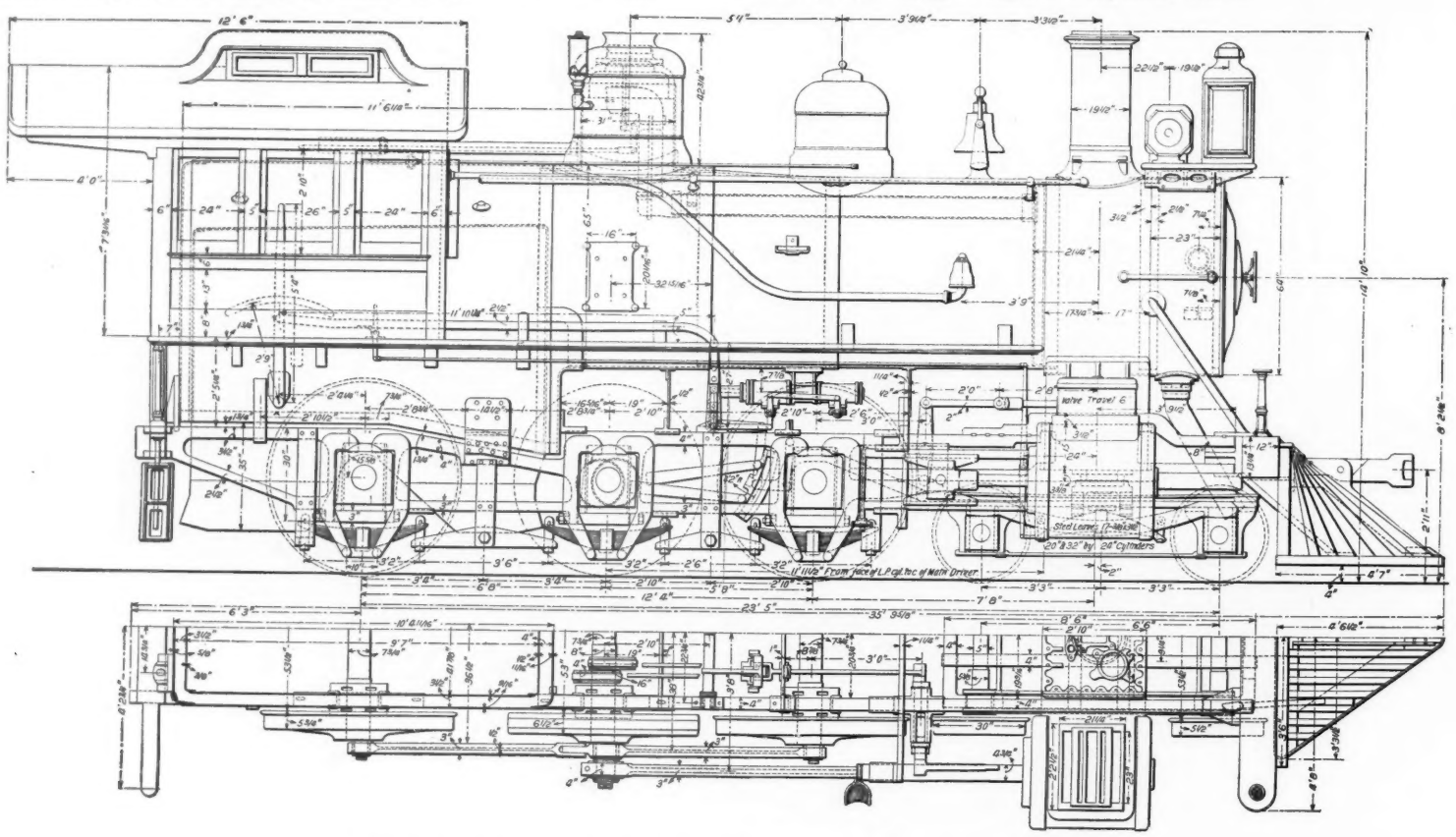
The Richmond Locomotive & Machine Works recently built for the Chesapeake & Ohio Railroad a 10-wheel compound locomotive which is now on exhibition at Atlanta, and which, after the close of the Exposition, will be put in passenger service on the Mountain Division between Clifton Forge and Charlottesville, Va. A profile of this section of the Chesapeake & Ohio is shown. The distance is 96 miles. The grades run up as high as 83 ft. to the mile. The average passenger train is scheduled at 3 hours and 10 minutes, and weighs about 350 tons. It will be seen, therefore, that a pretty robust locomotive is called for. It is expected to save at least 16⅔ per cent. of fuel as compared with the simple engines now running in this service, which have cylinders 20 in. × 24 in., and carry 175 lbs. boiler pressure.

The design of the engine is the joint result of the labors of the Richmond Locomotive Works and of Mr. W. S. Morris, Superintendent of Motive Power of the Chesapeake & Ohio. It is a combination of the standards for the class F 1 engines of the Chesapeake & Ohio with the compounding system patented by Mellin, and made and controlled by the Richmond Locomotive Works. The system of compounding is in general the same as that of the Richmond engine No. 2427, which has been tried on many railroads in the North and West, and which is now on exhibition at Atlanta. Details of the work of this engine we have published from time to time, and the results of trials on the Chicago, Milwaukee & St. Paul were published in the last issue of the *Railroad Gazette*. The average coal saving of the locomotive was 16.6 per cent. as compared with 13 simple engines in the same service. The general dimensions and various details are as given in the following table:

DIMENSIONS AND SPECIFICATIONS OF RICHMOND 10-WHEEL COMPOUND FOR THE CHESAPEAKE & OHIO RAILROAD.

Description.	
Type	10-Wheel compound
Name or number	2427
Name of builder	Richmond Locomotive & Machine Works
Name of operating road	Chesapeake & Ohio Railroad
Gage	4 ft. 9 in.
Simple or compound	Compound
Kind of fuel to be used	Bituminous coal
Weight on drivers	About 115,000 lbs.
" " total	145,000 lbs
General Dimensions.	
Wheel base, total, of engine	23 ft. 5 in.
" " driving	12 ft. 4 in.
Heating surface, tubes	1,789.95 sq. ft.
" " firebox	160.70 "
" " total	1,950.65 "
Grate area	33.44 "
Wheels and Journals.	
Drivers, number	6
" diameter	62 in.
" material of centers	Cast-iron, 56 in. diam.
Truck wheels, diameter	30 in.
Journals, driving axle (steel, Coffin process) size,	8 in. × 10½ in.
" truck (steel, Coffin process)	5½ in. × 10 in. long
Main crank pin, size	6 in. diam. 5⅞ in. long
Cylinders.	
Cylinders, diameter	H. P., 20 in.; L. P., 32 in.
Piston, stroke	24 in.
" rod, diameter (Coffin process steel)	3¾ in.
Kind of piston rod packing	Jerome
Pistons	H. P., cast-iron; L. P., steel, cast iron packing rings
Steam ports, length	23 in.
" " width	H. P., 1¼ in.; L. P., 1½ in.
Exhaust ports, length	23 in.
" " width	H. P., 3 in.; L. P., 3½ in
Valves.	
Valves, greatest travel	6 in.
" outside lap	H. P., 1 in; L. P. 1⅛ in.
" inside lap	H. P., 3/16 in. neg.; L. P., 1/8 in. neg.
Boiler.	
Boiler, type of	Wagon top
" working steam pressure	200 lbs.
" material in barrel	Steel, 5/16 in., 11/16 in. and ¾ in. thick
" diameter of barrel	60 in.
" " extended wagon-top	65 in.
Thickness of tube sheets	½ in.
Crown sheet stayed with	Staybolts 1 in. and 1⅛ in., diam.
Tubes.	
Tubes, number	256
" outside diameter	2 in
" length over sheets	13 ft. 4¼ in.
Firebox.	
Firebox, length	115 in.
" width	41⅞ in.
" thickness of sheets	Outside, 5/16; sides, back and crown, 5/16 in
" water space, width;	Front, 4 in.; sides, 3½ in.; back, 3½ in.
Smokebox.	
Smokebox, diameter	60 in
Other Parts.	
Tender, capacity	4,000 gals. water; 6½ tons coal
Tender, weight, loaded	80,000 lbs.
Cross heads	Cast steel with phosphor bronze gibs
Links	Hammered iron, case hardened
Driving boxes	Cast-iron, lined with phosphor bronze
Crank pins, Coffin process, steel, journals, main rod 6 in. diameter, × 5⅞ in. long, side rod 6½ in. diameter, × 5⅞ in long, and 4½ in. diameter, × 4¼ in. long.	
Rods	Steel fluted
Style of truck	4 wheel, rigid center
Kind of wheels	Tender, Boise; engine truck, Paige
Wheel base of truck	6 ft. 6 in.

Engine fitted with the Westinghouse American Standard outside equalized diameter brake with 9½ in. air pumps, also truck brake and train signal, Consolidated Car Heating Co.'s system of steam heat, electric head light, Leach sanding device, Corey lubricator, Cook bell-ringer, Janney coupler at front end of engine and rear of tender.



Elevation and Half Plan—Richmond Ten-Wheel Compound for the Chesapeake & Ohio.

Uncoupling Arrangements for M. C. B. Couplers.

The following is an abstract of the topical discussion upon the above subject, held at the October meeting of the Western Railway Club.

Mr. G. W. RHODES (C. B. & Q. Ry.): Uncoupling attachments for couplers, is one of the subjects that is named for discussion at the next annual convention of the Master Car Builders' Association. It has been found that there is a great deal of difference in the uncoupling arrangements of the many different M. C. B. couplers, so much so that when trainmen get to the cars they don't always operate them to the best advantage, not knowing just how the device works. Inasmuch as we have a standard contour line for the association in couplers, in place of allowing many different patented devices to get into use, if the association got up a device, it would result in much greater uniformity. The Executive Committee of the Master Car Builders' Association has appointed a committee to consider this, and I believe Mr Potter is its chairman. We all know that it is desirable that there should be a standard to copy after as closely as possible.

Mr. A. E. MANCHESTER (C. M. & St. P. Ry.): It would seem desirable that there should be a uniform uncoupling device. The men who have to use the uncoupling devices often have to do so in the dark, or with the aid of a lantern, and that is not the right time to stop and figure out the key to the situation. I think the Master Car Builders' Association is working in the right direction when it proposes a uniform uncoupling device, so that whoever may be acquainted with one means of uncoupling will be acquainted with all.

Mr. A. W. GIBBS (Pennsylvania Railroad): As you all know, there has been a great deal of trouble from drawheads pulling out and dropping down, and I suppose a good many people have been looking around for some satisfactory method of preventing it, or if not preventing it, of minimizing the damage done. Mr. G. L. Potter brought up the suggestion that a simple strengthening of the uncoupling arrangement without change, would be good. The suggestion was this: That if the uncoupling rod fulcrum over the coupler was raised, and the links joining the end of the lever to the vertical lifting pin strengthened, in case of the coupling pulling out, this link would shorten, lift the pin, open the knuckle and leave it open, so that the coupler would not necessarily pull out and drop down. A number of experiments were made. Trials made by removing the tail bolt key are inconclusive, because no strain is brought on the parts, and the coupler quietly opens successfully every time. In service, however, the failure of the tail bolt is usually the result of an application of considerable force, and this condition must be introduced into tests to give them any value. In practice this was done by reducing the tail pins to about three-quarters of an inch, and causing breakage by giving the train a severe jerk. As a result it was found that by this suggested slight strengthening of the parts, the coupler would open successfully in about 75 per cent of the trials, and when opened, the coupler would be held by the chain, preventing it from falling on the track. I should think that a device consisting of the strengthening of the existing parts should receive some attention, because there has been so much trouble from couplers pulling out and falling down. In this connection it should be stated that the uncoupling lever should be firmly secured to the sills

by some device better than the small lag screws commonly used.

Mr. W. H. LEWIS (C. B. & N. Ry.): I want to dissect a statement that my friend MacKenzie has made here. He said that in an examination of the cars on his line he found that the defective uncoupling devices were represented by three one-hundredths of one per cent. That is a very small percentage. I believe Mr. MacKenzie has 7,000 cars on his system, and three one-hundredths of one per cent. would represent about two and one-tenth cars that were defective. A short time ago I saw one of Mr. MacKenzie's cars on our line, in which both coupling devices were defective, and it was thus very evident that about half of his defective cars had got away from him. I would not be surprised if some of the other members, if they looked over Mr. MacKenzie's equipment, would find the other half.

CHAIRMAN WAITT: Surely, there are a great many cars in the country to which very little attention has been given as to the way in which the uncoupling devices have been put on. I have called the attention of those in charge of the motive power departments of other roads to some of their cars that have been going over our line, where the release rig casting had been simply put on with a couple of lag screws, or three perhaps (a three-inch lag screw through a piece of ⅞ sheathing), and you can imagine how much that would hold. A very little pull would take it off. Many times the attachment is put on in such a way that an excessive pull on the coupler, the draft spring being almost entirely compressed, would partially open the lock, and I have no doubt that many of the cases of uncoupling of trains that we have had during the past years with the M. C. B. coupler, have been due to carelessness in not adjusting the uncoupling attachments so as to provide for the compression of the spring. When you come to look into it there are a good many points with regard to so simple a thing as the uncoupling attachment for a coupler that are well worth study and care in designing, and not only in designing, but in seeing that the designs are properly carried out by the men who apply the attachment to the cars. I hope that the thoughts that have been brought out here to-day will be beneficial and that all of us who are interested may go home and see that proper care is paid to the application of uncoupling devices on our cars, as without them an automatic coupler is of no use. It is a very difficult thing to think of arriving at very much uniformity. We may arrive, perhaps, with most of the couplers at uniform castings for holding the lever in its various positions, according to whether we want the cars to be coupled or not. But when we see the multiplicity of designs of the M. C. B. couplers, some unlocking at the side, some on top, some by rotary motion, and hardly any two that will handle alike (unless perhaps it is some of the older couplers in the market), it seems discouraging to think of much uniformity ever being brought out of the uncoupling devices, unless we wipe out of existence 99 per cent. of the couplers themselves—which perhaps might be a good policy, considering the miserable devices that some are that are on the market.

A Glimpse of the Exhaust Jet.*

BY PROF. WM. F. M. GOSS.

In a locomotive at speed, the jet of exhaust steam approximates closely to a steady stream, flowing from a pressure of from 3 to 10 lbs. by gage, to a pressure somewhat below that of the atmosphere. It constitutes the force in action within the front end of the locomotive and, to the designer of draft appliances, its form between the exhaust pipe and the stack is a matter of importance.

Last year Mr. Robert Quayle, Chairman, and others of a committee of the Master Mechanics' Association, made a study of the form of small jets of steam flowing from a considerable pressure into the atmosphere. From results obtained it appeared that the shape of the tip had little or no effect upon the form of the jet, the sides of which in all cases diverged at an angle of about 15 degrees.

More recently, in the laboratory of Purdue University there has been employed a simple piece of apparatus which could also be used to define the form of the exhaust jet for any engine while engaged in its usual service on the road. The device is shown by Fig. 1, and may be described as follows:

Tubes A and A^1 are arranged in suitable fittings, to slide horizontally across the smoke-box, in a line directly over the center of the exhaust pipe. The inner ends C and C^1 of these tubes are drawn down to a curved tip of small diameter, and the material about the orifice is filed away so as to form a sharp cutting edge. The stems of the tube are graduated into inches and tenths of inches, the zeros coming under the tally marks D and and D^1 respectively, when the inside ends C and C^1 are over the center of the exhaust pipe; that is, upon the line E F. The sum of the readings at D and D^1 will therefore always equal the distance separating the inside tips of the tubes, which in Fig. 1 is 9¾ in.

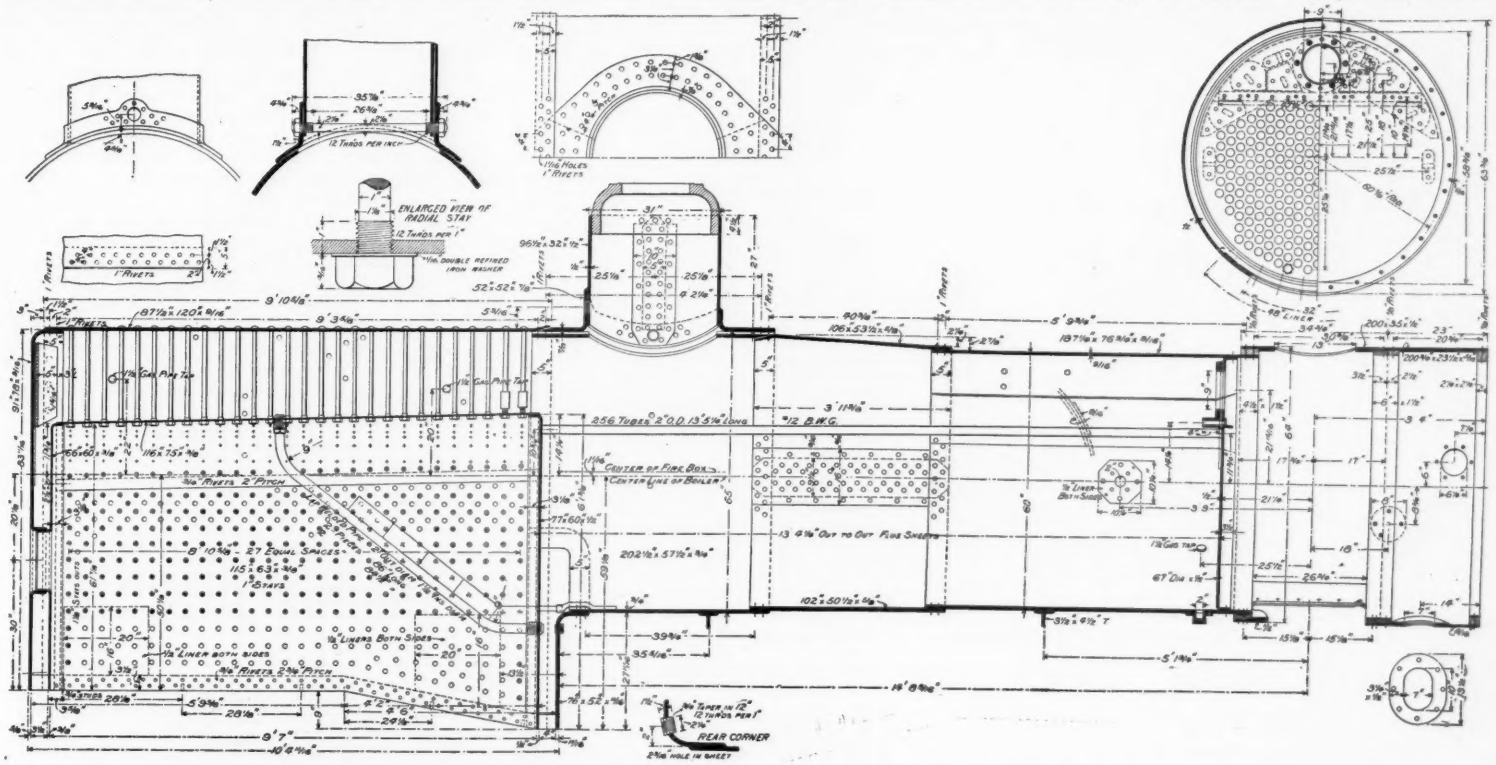
The sliding tubes are open at both ends, and through them there is free communication between the smoke-box and the outside atmosphere. When not in use, they are drawn outward until the tips C and C^1 lie close against the inside of the smoke box. If the locomotive to which they are attached is using steam, there is a constant current of cool air passing through the tubes into the smoke-box, the pressure in the latter being less than that of the atmosphere. The capacity of the tubes, however, is much too small to allow the passage of air enough to disturb the draft conditions, but enough goes through to keep the tubes entirely cool.

When an observation is to be taken the tubes are slipped forward into the smoke-box until the tips enter the stream of exhaust steam, a position which in each case is at once made manifest by a reversal of the air current in the tube, by the consequent change in the temperature of the tube, and by a discharge of steam from its outer end.

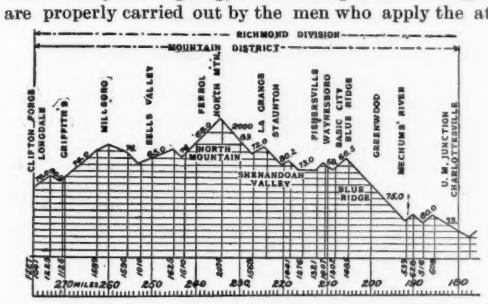
If the correct position is found the tips of the tubes will be just on the boundary of the jet of exhaust steam. Both tubes having been thus adjusted, the amount which they are displaced from the line E F is read off from the stem at D and D^1; the sum of the two readings giving the width of the jet upon the line at which the pipes are fixed. Having this width, the height of the tube tip above the exhaust pipe, and the dimensions of latter, the form of the jet may be approximately determined.

It will be seen that the apparatus is extremely simple and that it may be readily used upon the road. Its accuracy depends upon the size of the orifice, and somewhat upon the delicacy of the tube and of the graduations upon it. The tubes used at Purdue are made from ¼-in. steam pipe and the orifice at the tip is about $\frac{3}{32}$ in. diameter. Either tube can be placed with certainty within a tenth of an inch of the edge of the steam jet; that is, in a given position of the tube air will flow into the smoke-

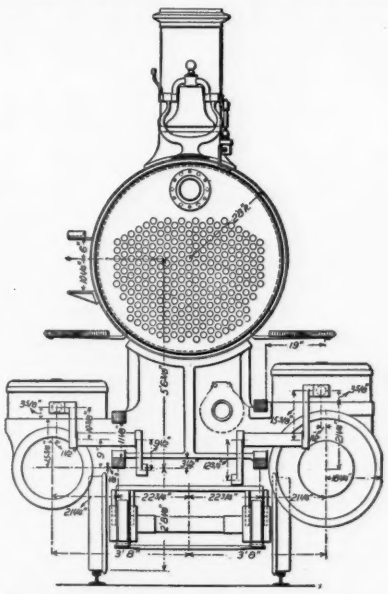
* A paper read before the Western Railway Club.



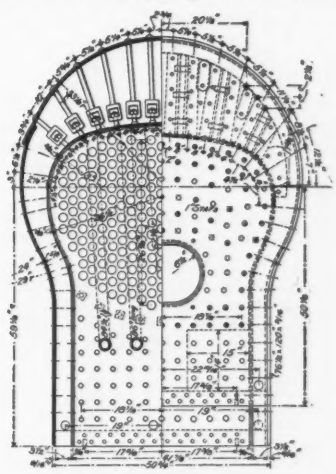
Details of Boiler—Richmond Ten-Wheel Compound for the Chesapeake & Ohio.



Profile of C. & O.—Charlottesville to Clifton Forge.



Sectional Elevation—Richmond Compound.



Firebox—Richmond Compound.

box, while a movement of less than a tenth inch will result in the flow of steam out of the tube. This, taken in connection with other related dimensions for the Purdue engine, allows a possible maximum error in the measured width of the steam jet along the line in question of about two per cent.

Greater accuracy than this is perhaps unnecessary, but with a view to securing more refined measurements, use has been made of a manometer, consisting of a glass tube bent U-shaped and sealed with water, attached to the outer end of the sliding tube as shown at *H*, Fig. 1. When the tip *C* of this tube is withdrawn from the steam jet, the gage indicates a vacuum; the U-tube becomes a draft gage. But when the tip is thrust into the jet of steam, pressure is indicated. Near the changing point between vacuum and pressure, a small movement of the sliding tube gives considerable change in the reading of the manometer. For limits close about the edge of the steam jet it is fair to assume that a given displacement of the water in the manometer tube always results from a given position of the tip of the sliding tube, relative to the border of the steam jet. Hence, by use of the manometer, readings from the sliding tube may be duplicated with great certainty.

As the borders of the steam jet are known to shade away gradually, it would seem best, where comparative rather than absolute results are required, to always move the sliding tube inward until a slight pressure is shown by the gage. But, as has already been said, the use of a manometer secures a refinement which is necessary only where results are required for purposes of careful comparison.

An average result of several measurements made by use of the apparatus described is shown by the dimensions given in connection with Fig. 1. The angle of divergence corresponding to these dimensions is 13¾ degs. The dimensions may be accepted as nearly correct for ordinary conditions of running for the engine experimented upon, but, for reasons which will be given, too much reliance should not be placed upon any statement as to the value of this angle.

Several attempts have been made to secure an outline of the jet of exhaust steam by means of photography. It was found that with the most sensitive plates obtainable, a time exposure was necessary. A photograph thus obtained is given as Fig. 2. The process of exposing the negative requires the locomotive to be run with the front end open, and it is a question whether under this condition the jet would be of the same form as with the front end closed. It is not likely that the difference would be great, but in any case the process would be impracticable on the road. Even in the laboratory it is useful only as auxiliary to the more definite process already described.

Attention has already been called to the fact that the divergence of the steam jet should not be expressed in degrees. The reason for this will be appreciated after a close examination of Fig. 2, or, since this figure in the reproduction is not so clear as in the original, by the line sketch, Fig. 3, which is based on the photograph. These figures show the steam jet to be bounded by lines which are somewhat curved. It is only for a short distance above the pipe that the divergence appears to be uniform. Higher up the lines curve toward each other, becoming nearly or quite parallel before entering the stack. If the lower portion only of the jet is considered, as from *a* to *b*, Fig. 3, the angle is identical with that found by Mr. Quayle, namely, about 15 degrees, but by including a greater length, as from *c* to *a*, this angle is very much reduced. It is evident, therefore, that no single angle can properly represent the angle for points both adjacent to and remote from the pipe, and that efforts should be directed to a determination of the actual increase in the width of the jet at known distances from the exhaust tip.

In following out this study of the form of the jet, several tubes might be employed on one side arranged to cover the vertical distance between the top of the exhaust pipe and the base of the stack at intervals of from 4 in. to 6 in.—that is, upon lines as *x*, *y* and *z*, Fig. 1.

It is but proper to add that the efforts thus far made at Purdue have all been with a view to developing a method of procedure. But little actual work has been done except in proving the value of the apparatus already described. If the proposed process is thought to possess merit, data should be expected from the road as well as from the laboratory.

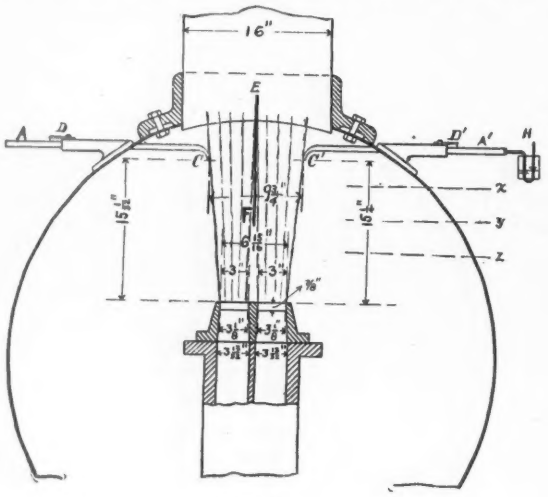


Fig. 1

Fig. 3.

Useless Tubes in Boilers.

Fourteen years ago an article under this heading was published in *The Locomotive*. It attracted some considerable attention at the time, and as there are still some boilermakers who do not seem to understand how a tube *can* be useless, we reproduce the article in question below, and we hope shortly to publish some further experiments on the same subject.

In the early history of the horizontal tubular boiler, the opinion prevailed that the more tubes that were crowded into a boiler the greater the efficiency would be. It was not uncommon to find the lower half of a boiler literally packed with 2½-in. tubes. They were put down as near the bottom and the side sheets as the flanging of the tube-head would allow. They were arranged in the boiler on what is known as the "staggered" plan; that is, instead of being placed vertically one over another, they were so arranged that the tubes of one row were placed over the spaces of the row next below, and there were consequently no unobstructed spaces through which the water could circulate. But this was not the greatest difficulty. It is well known that the waters used in boilers generally carry more or less impurities in suspension—mechanical or chemical—and that these are deposited in the process of evaporation. The deposit so formed may consist of the carbonates or sulphates of lime or magnesia, or of argillaceous matter, or of mud. It settles upon the bottom and the tubes of the boilers, and if the cleaning is not frequent and careful there will be formed, on the bottom and among the tubes, a very hard scale, which cannot be removed without taking out the tubes. When this condition of things has come about, the efficiency of the boiler is greatly reduced. The heating surface being covered, more or less, by a substance which is a non-conductor of heat, the heat in passing over it is not taken up, and so passes on and is lost.

Matters were materially improved, in the course of time, by the introduction of tubes of larger diameter (3 inches), arranged in vertical and horizontal rows; but the tubes were still carried very near the bottom and sides of the shell, and the difficulty was only partially remedied. A great many boilers are made in this manner to-day, and it is a difficult matter to convince some boiler-makers that it is erroneous. Their argument is, "the more tubes, the more heating surface"; and it must be said that manufacturers, in many instances, have the same views, and in ordering boilers they demand an excessive number of tubes. One object in view in preparing this article is to show that too great a number of tubes does not make the boiler safer, or more efficient. It has been found by experiment that if the two lower rows of tubes in a boiler whose tubes extend down close to the shell are plugged up, the efficiency is not impaired—we are speaking now of externally fired boilers. By studying the progress of the heated gases as they leave the furnace, it will be seen that they pass over the bridge wall, "lick" the bottom of the boiler its entire length, and then turn upward at the rear end and enter the tubes. The levity of these heated gases carries them mainly to the upper rows of tubes, and only a small portion of them enters the lower tubes. To demonstrate this in a way that will be understood by all (though it may not be regarded as occult enough to satisfy some individuals) a clean piece of soft white pine was placed at the front end of a boiler, nearly in contact with the ends of the center (vertical) row of tubes, and was left in that position for several days. When again examined it was found that the end of the stick in contact with the upper tube was burned to a coal, so that it barely held together; at the tube next below it was little less charred, and the effects of the heat decreased more and more toward the bottom, as indicated in the illustration. Against the two lower tubes the wood was only a little discolored, showing that the upper tubes were most effective, while the very lowest were of little account.

Another fault with the "close" arrangement of tubes is that, besides the trouble from deposit of sediment, there is no body of solid water for the heat to act upon as it leaves the furnace. In our experience we have found great difficulty with this arrangement of tubes, particularly when used with bad water. It gives a greater area of tube surface, but a considerable portion of the surface so gained is useless, and worse than useless, from the fact that the water space is unduly taken up by the superfluous tubes. In an arrangement of tubes which is far better, the lower roll is well up from the bottom of the boiler, leaving a good solid body of water for the heat from the furnace to act upon. The tubes are kept well away from the shell of the boiler on the sides, no tube being nearer than 3 in. to the shell, and a space of double width is provided for between the center (vertical) rows of tubes. Good circulation is obtained, and the boiler is much easier cleaned and maintained at its maximum efficiency.—*The Locomotive.*

The U. S. Dredging Steamer Gen. C. B. Comstock.

In October, 1894, a contract was entered into by the Bucyrus Steam Shovel & Dredge Company, of South Milwaukee, Wis., to build a hydraulic dredging steamer for the harbor improvement works at Galveston, Tex. The work now being carried out there under the supervision of Maj. A. M. Miller, of the U. S. Engineer Corps, has for its object the creation of a deep water port, and one of the first and principal necessities was the dredging of the bar which obstructs the entrance to the bay. For a long time this bar has restricted the draft of vessels entering the harbor to 10 or 12 ft. The formation is a very fine, hard, white sand, and a considerable improvement has been effected by the construction of jetties, so that the ebb and flow of the tide between the jetties helps to create and maintain a deep channel. The action of the tides, however, was insufficient to accomplish the result, and in order to hasten the work it became necessary to dredge the bar. The dredging of ocean bars presents a set of conditions entirely different from those met with in ordinary dredging, and a special type of vessel has been developed to meet these conditions. Owing to the exposed situation and the consequent necessity of working in considerable seaway, it is impracticable to use anchorages of any kind, or to load the material into scows alongside. The type of dredge, therefore, becomes a self-propelling hopper steamer, equipped with centrifugal dredging pumps, which pump the sand from the bar while the vessel is being slowly steamed over it; the sand being received into the hoppers in the hold of the vessel and discharged at sea through valves in the bottom.

The steamer Gen. C. B. Comstock is one of the latest and most complete examples of a vessel of this type, and her trial performance shows that she is capable of very excellent results. The hull is of wood, 177 ft. long over all, 35 ft. 6 in. beam, 16 ft. depth of hold, and the two hoppers have a collective capacity of 500 cu. yds. when filled to the level of the main deck. They can, however, be filled considerably higher than this, as they are surrounded by a coaming 33 in. high.

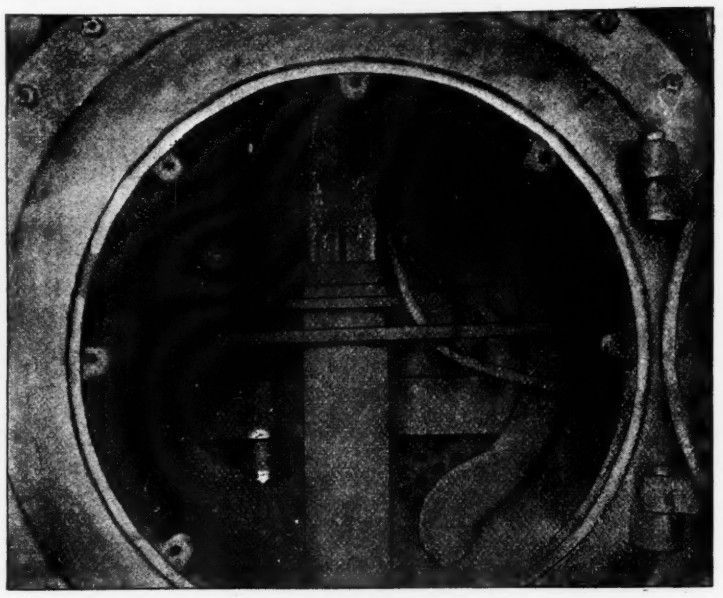
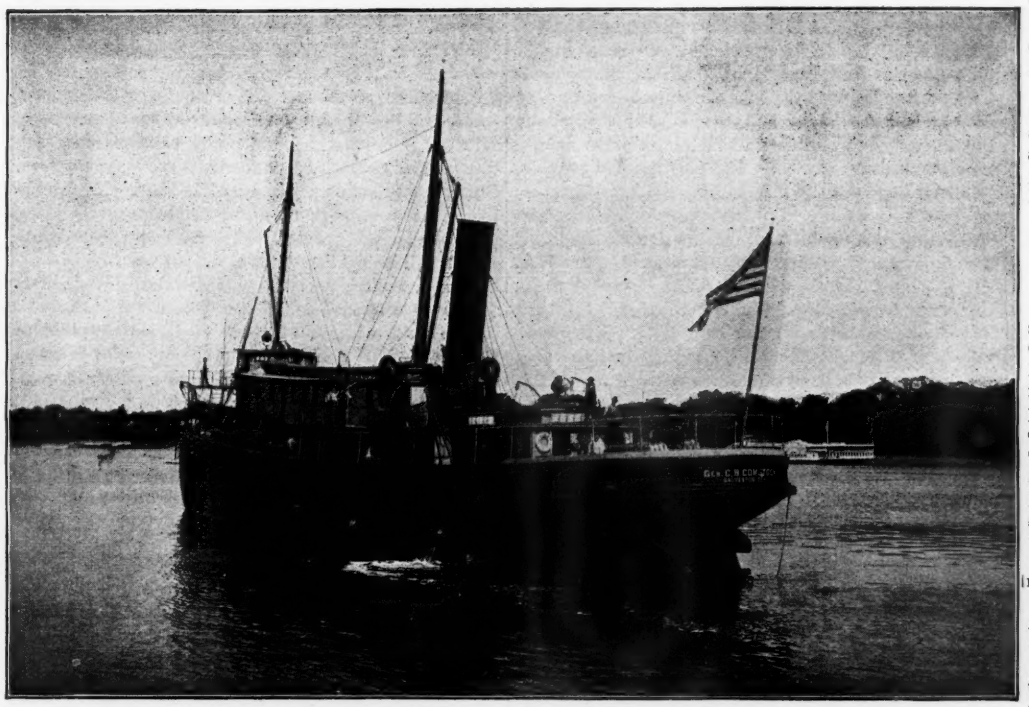


Fig. 2.

The propelling engines drive the vessel at a speed of 10 miles an hour when light, and 8 miles an hour when loaded. Steam is furnished by two marine boilers 10 ft in diameter by 11 ft. 6 in. long, each boiler having two Fox corrugated furnaces. Immediately forward of the boilers is the pump room. Here are located two independent centrifugal dredging pumps, each driven by compound direct connected engines of 125 H. P. Each pump has 15 in. suction and discharge, and is specially designed to withstand the abrasion and wear of the sand, and to give freedom of flow through the passages. There is a thrust bearing on the shaft, of the multiple collar type, and an intercepting pressure chamber provides for the exclusion of the sand from the pump shaft bearing. The cranks are balanced, and the engine runs steadily at 200 revolutions, but in ordinary work the speed is about 195 revolutions.

The suction pipe enters through the side of the boat just above the load-water line. There is a heavy flanged socket casting fitted into the side of the vessel which receives the swivel elbow of the suction pipe. This elbow is a steel casting, and has sufficient length of bearing in the socket to hold it in place and take the entire strain of the suction pipe without any additional support. The stuffing box for the elbow is inside the boat, and easy of access from the pump room. The suction pipe is 50 ft. long in two sections, and is made of wrought iron welded tubing. There are two flexible connections in the pipe to permit freedom of movement in a sea-way under all conditions. The drag at the lower end of the suction pipe is of cast iron, and so arranged that if it should encounter any immovable obstruction it will rise up and pass over it automatically without unduly straining the suction pipe. The suction pipes are sus-

pended on each side from two steam cranes with wire rope hoisting tackle, by means of which they are readily raised or lowered to the required depth. A spring indicator on the cranes shows the tension of the ropes and the degree of pressure of the drag upon the bottom. The drag is furnished with removable steel cutting blades.



The United States Sea-Going Dredger Gen. C. B. Comstock.

From the pumps the discharge is carried forward over the hoppers in two large troughs which have openings or slides at suitable intervals so that the material can be properly distributed in the hoppers. The discharge of the pumps consists of a mixture of sand and water, the percentage of sand varying from 10 to 40 according to circumstances. The water overflows from the hoppers through suitable openings, passing over the deck, while the sand remains in the hoppers. During the trial the hoppers were filled with water only, in 4½ minutes with both pumps running. This is equal to a capacity of 11,000 gallons per minute for each pump. The time occupied in opening the valves and discharging the load is 7½ minutes.

The vessel is fitted with Providence steam windlass, Chase steam steering gear, Westinghouse electric light system, Huntington search lights, and is fully equipped as a sea-going vessel. The quarters for the officers and crew are ample and commodious. They are constructed over the hoppers and are especially designed for a warm climate. The pilot-house and bridge is placed forward. There are two masts, each fitted with derrick booms arranged for handling the suction pipes and the vessel's machinery. Complete deck awnings are pro vided both forward and aft.

The propelling engines are by Neafie & Levy Co., of Philadelphia, and the hull was built at the yards of Hugh Ramsay, Perth Amboy, N. J. The vessel steamed to Galveston, arriving there Aug. 31, and her trial tests have been satisfactorily completed and the vessel accepted by the Government. The vessel was built from the designs of A. W. Robinson, M. Am. Soc. C. E , who also designed the pumps, pumping engines and dredging equipment, the latter being built at the works of his company at South Milwaukee, Wis.

Electricity at the World's Fair of 1900.

According to report of the Commissioner General of the World's Fair to be held at Paris in 1900, the Champs Elysées and the Esplanade des Invalides, now separated by the river, will be connected by an uncommonly wide bridge. They and both banks of the river thence up stream, 267 acres in all, will comprise the exposition grounds. Their nearness to the heart of the city insures the nightly presence of a vast crowd, and the brilliant lighting of the two connected places becomes, therefore, a matter of prime importance. As it is also intended to keep all the buildings open until midnight, the power required for lighting reaches 12,000 H. P., against 1,500 H. P. in 1889.

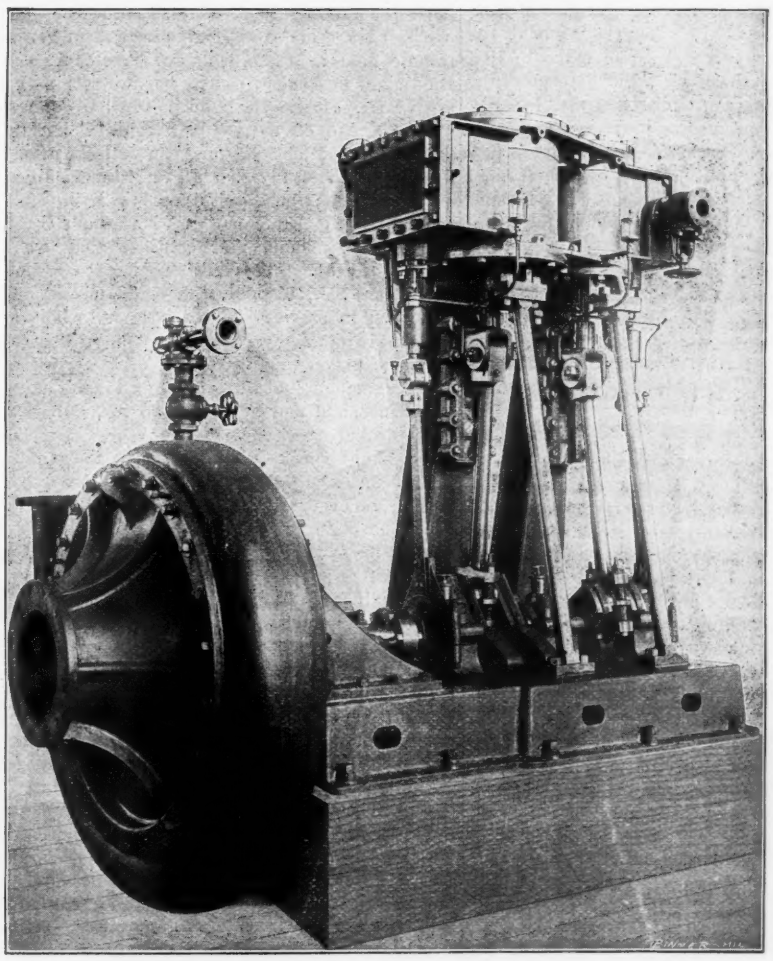
The power required to show the exhibited machinery and apparatus in motion amounted to 350 H. P. in 1855; 635 H. P. in 1867; 2,500 H. P. in 1878; 5,500 H. P. in 1889, and is estimated at 8,000 H. P. in 1900. Electric power transmission will be employed, as the scheme of organization of the exhibits contemplates the close union of raw material, methods and means of manufacture and finished products. Machinery will thus have to be kept in motion all over the grounds.

The efficiency of the power distribution at Chicago, where a 500 volt continuous current was used, was 73.37 per cent.; at Lyons, in 1894, where continuous and alternating current was used, it has been 73.38 per cent. Assuming 70 per cent. total efficiency, the required steam power is stated as 28,500 H. P., reduced to 20 000 H. P. by the following schedule :

Furnish during the day to motors	11,400 H. P.
" from 7 p. m. to midnight to one-fourth of the motors	2,900 H. P.
" for light	17,100 H. P. 20,000 H. P.

In addition a water power transmission is proposed of 2,100 H. P. from the dam at Suresnes, a distance of somewhat over 6 miles from the grounds. The assumed efficiencies of 0.75 for the turbines; 0.80 for connection of turbine and generator; 0.90 for the generator and 0.90 for the line, deliver 1,170 H. P. at the grounds and result in a total efficiency of 0.49.

The general policy for the electrical exhibit is thus outlined:



Centrifugal Pump for the Sea-Going Dredger Gen. C. B. Comstock

1. Exhibitors to erect central stations for the selling of current to the administration at a predetermined tariff.

2. The administration to erect the line for the distribution of the current.

3. The administration to sell the current from its line to contractors, who shall furnish current for light to the exhibitors located on each one's concession and do the public lighting on the same.

4. Said contractors to furnish and install motors for the operation of exhibited machinery and apparatus, and the administration to furnish the current to operate the motors.

This scheme differs from precedents. At Chicago the administration itself made all the pubic and private installations at Lyons a general contractor was charged with the complete organization and installation of the electric service for light and power. At Paris a mixed system will be tried.

During the 180 days of the fair 38,520,000 H. P. hours will have to be furnished; the mechanical, electrical and wage account for same is placed at 6,900,000 fr., or about $1,380,000.

The above data are condensed from a paper by M. G. Dumont read before the Soc. C. E. of France.

The Union Elevated Loop in Chicago.

Although the Union Elevated Loop Company has secured the necessary franchise from the Chicago City Council to build the loop on Wabash avenue, south of Lake street, and has exhibited to the Council the signatures of the majority of property owners along the proposed route, yet there seems still to be considerable difficulty in the proposed construction. On Saturday, Oct. 26., the petitions of several property owners, asking for an injunction to prevent the work in front of their property, were filed in court. As no injunction could be got out before Monday, the contractors put a large force of men at work Sunday. The surveyors located the places for the foundations, and the excavations were made.

On Monday an injunction was issued by Judge Horton restraining the work, and the case has now been taken to the Appellate Court. As it is well known that the property owners along the proposed route were paid for their signatures giving consent, one of the principal points in the argument will be as to whether the consent thus obtained is valid. Another point is whether a private party has the right to enjoin the construction of an elevated road. The case will soon come up, and a decision on these points will be important. In the preliminary hearing before a Master in Chancery it has been developed that one of the men who had been the foremost in fighting the petition to obtain consent of the property owners, two months ago, had himself soon afterward signed his consent for the sum of $8,000. Pending the settlement of these cases, the work is progressing in other localities, and foundations are being put in.

On Fifth avenue the foundations are nearly all in as far south as Van Buren street. The cross-over at the southern end of the loop is now under discussion, but its exact location not determined.

Foreign Railroad Notes.

The number of passengers, arriving at and departing from the Paris station of the Western Railroad of France, known as the St. Lazare station was nearly 40 millions in 1894, an average of 108,328 per day. It was thought that the travel of the Exposition year 1889 would prove the maximum for some time, but actually it has grown nearly every year since. The number of passengers was 30,280,215 in 1889 and 39,539,599 in 1894. Last year there were 20,010,586 departures and 19,529,013 arrivals at which rate of difference Paris would soon be depopulated. As was to be expected from such enormous figures the suburban traffic accounts for most of them, viz., 17,554,842 departures and 17,143,703 arrivals, leaving 2,405,744 departures and 2,385,310 arrivals by the longer trains, or at the rate of 6,728 departures and 6,535 arrivals daily—certainly a very respectable traffic, considering that five other great railroads have stations in Paris.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

A Washington correspondent of one of the New York papers has discovered that officers of the Corps of Engineers, United States Army, when acting as disbursing officers, are not required to give bonds, being perhaps the only class of government officers who are not bonded. The correspondent goes on to say that "it is very likely an effort will be made by Secretary Carlisle to place engineer officers under bond." He says it is not known "just why this neglect has continued for so many years," and adds, that "fortunately there have been few failures among engineer officers to properly account for public funds." This fact has long been familiar to the profession. It is one of those facts of which engineers are proud; it is one of the minor things, the sum of which go to make up that pride in one's class and calling which is one of the noblest and most effective of human motives. In truth, the officers of the Corps of Engineers are under the heaviest kind of bonds. Everything that is most precious to a man is staked on their honor. Profession, social position, pension after retirement, the esteem of one's fellows, are all dependent upon the fidelity to trust of the army engineer, and the result shows that it would be impossible to put men under more effective bonds. Throughout the long history of the Corps it is impossible to find more than three or four cases in which officers have misappropriated any of the immense funds which they have disbursed. We sincerely hope that no change will be made in the practice which has worked so well for generations.

A rear collision of passenger trains which occurred at Hyde Park, Mass., on Oct. 24, and which has been the subject of a protracted inquiry by the Massachusetts state railroad commissioners, is an illustrative instance showing how the space-interval and the time-interval methods of running trains are in one respect alike. There was a clear view of the foremost train (an accommodation standing at the station) of four miles; there were automatic block signals (Union clock-work), home and distant, fixed at suitable intervals along the road and working properly; the tail-lights of the train shone brightly (the hour was 5:30 p. m.) and the engineman of the second train, an express, was one of the most experienced on the road and bore an excellent reputation; and yet the rear car of the way train was wrecked, the rear brakeman and one passenger killed, and twenty or more passengers injured. The two methods of spacing are alike in the certainty with which both will fail together, if there be sufficient carelessness. The inquiry was devoted largely to the conduct of the brakeman, now dead. He had never run with this conductor before, and had been a brakeman only a year or so. He had been supplied with a liberal quantity of fusees, but did not throw off any, though he told the conductor when he received them, an hour before, that he knew how to use them. The Chairman of the Commission asked some questions about the flagging rule (No. 99), but they only served to show how inadequate that rule is for meeting certain emergencies; and the discussion did not alter the main fact, that the negligence of the engineman would have been wholly inexcusable if there had been no rear brakeman whatever and no flagging rule. The engineman did not appear at the hearing. The automatic signals have lately been changed from the left hand side of the road to the right hand and the way train had been running on this time only a week (during which time it had repeatedly fallen back on the time of the express); these are the only circumstances that any one can think of which offer any shadow of excuse for the engineman to fall back upon. As the brakeman is dead, his negligence may be made the subject of any amount of speculation, and that of the engineman will probably be even harder to explain: but certain of the circumstances so closely resemble those of previous accidents that to some railroad managers the moral to be drawn from the collision will be quite plain. First, the brakeman was inexperienced and his conductor was not thoroughly acquainted with him. This is the point if flagging is to be depended upon. Those who believe in making block signals fulfil their office to the utmost, not depending upon the flagman, will say that the engineman should have had the fireman look at every fixed signal (the fireman was "busy firing"); and, in the absence of further explanation of this lapse, that enginemen should be tested oftener, by false danger signals, to see what their habits are. These are the main remedies unless we are to have a signalman at every signal or an automatic brake-applying apparatus.

Those who depend upon theory and the book of rules will object to the foregoing reasoning, as to the brakeman's failure, as weak; but experience teaches that it is strong. Hundreds of brakemen have made good records only because they have had a good conductor to look out for their weak points for a good many months or years. The success of many has depended upon the fact that they have run constantly on the same train, or, if they have changed, have had good fortune until they got thoroughly acquainted with the new run. This poor fellow at Hyde Park found himself, the very first week, on a train which was frequently if not habitually followed very closely by another and faster train, a condition in which dependence upon the time-interval method is wholly fallacious and always has proved troublesome. The query is pertinent, in passing, What is the use of spending thousands of dollars on automatic signals to keep trains two minutes apart, if fusees are to be used to keep them five or ten minutes apart? From what we have said about the training of brakemen, it will be understood that we regard one year as a short time in which to train a man to be flagman on a passenger train. This may not seem very creditable to American railroad discipline; indeed, we do not say that a year is in every case too short a time; but, with men and methods as they are, the statement is borne out by facts. In the last notable rear collision that was due wholly to the flagman's negligence, that at Hastings, N. Y., in 1891, the flagman was one who had been in service about a year and who was intelligent in other ways, but did not know how to flag. The delicate yet weighty lessons necessary to make a good flagman are not learned with certainty except by experience, and new brakemen do not always get a great deal of experience in one year. We rehearse these points about flagging because the above indicated improvements in training are not only necessary, but feasible, on every road where the time interval is used. We do not wish to discredit the block system by admitting that we deem it necessary to bolster it up by the partial or complete use of the time-interval system as an auxiliary. That the use of the block system in America is characterized by laxity, of various degrees, is, however, patent to all, and the most generally applicable lesson of the Hyde Park collision is that either one spacing system or the other ought to be perfected. Two imperfect plans do not take the place of one perfect one. If enginemen are not educated to the highest possible degree of vigilance—either by the means we have mentioned or otherwise—there will be no cause for surprise if the newspapers or the legislatures demand that fixed signals be equipped with costly automatic appliances to stop engines in spite of careless runners; and every time that an engineman runs past a signal without heeding it, strength is added to the position of those railroad managers who hold that no block signal is effective without a man constantly at hand to detect disobedience of its indications. Managers who desire to avail themselves of the economy of automatic signals should see to it that this view does not prevail too extensively.

Some Recent Rail Specifications.

We ask the attention of railroad engineers, rail inspectors and rail makers to the specifications for rails for India, and to the letter on Rail Making in England, published on the first page of this issue. Rail makers particularly should read the specifications and then next Thanksgiving Day they should give special thanks that it is their lot to make rails for the good natured citizens of this blessed Republic. Their good fortune is not so much that the Indian specifications are more rigorous than those imposed by a few roads and a few rail inspectors, as that they suggest a more severe standard than is usually held up by the railroads in this country. Whether or not Mr. Leighton is right in supposing that the English make better rails than our own mills we do not pretend to say. An opinion on this matter could only be valuable after comparative observations of many examples, and under the present trade conditions the chances of comparison are not numerous. But the rail makers who are inclined to invade foreign markets in competition with the Englishmen can judge from the Indian specifications something of the conditions that they will have to meet.

It is interesting to observe the chemical specification. The maximum carbon of the Indian specification is precisely the minimum for rails of the same weight as proposed by Mr. Hunt in the specifications for Western rails which we published in our issue of Oct. 18, page 688. The Indian carbon specification is 0.30 to 0.45; Hunt's is 0.45 to 0.50. Indeed the tendency in this country is to higher carbon than Hunt calls for here, his specification in this instance having been written for Western mills which must use pig rather higher in phosphorus than that which is commercially available to Eastern mills. This tendency to crowd up the carbon in the United States is in a great degree owing to the persistency of Mr. P. H. Dudley, who in 1892 specified 0.50 to 0.60 carbon for the New York Central for rails of 75 and 80 lbs. For 100-lb. rails he specified at the same time 0.65 to 0.75 carbon. Since that time many eastern railroads have ordered high carbon rails. For instance, we have analyses of some excellent 80-lb. rails made for the Delaware, Lackawanna & Western, which show 0.576 and 0.58 carbon. The Boston & Albany, the Buffalo, Rochester & Pittsburgh and the Central Vermont are among the other roads which in recent years have adopted 0.50 to 0.60 carbon for 75-lb. and 80-lb rails. We do not speak now of the higher carbon, running up to 75 points, which has lately been used in 95-lb. and 100-lb. rails, but of rails comparable in weight with the Indian rail. One would suppose that in a country where the roadbed is never frozen a harder rail could be used than in this land of alternate frost and heat. Whose practice is best in this one particular? We suspect that in this, at least, we are going ahead of the English engineers.

It will be noticed the Indian phosphorus specification is low, 0.06. Here Hunt gives more latitude even with higher carbon, viz., P. 0.085. Dudley, however, sticks rigidly to P. 0.06. Here, of course, we see the effect of commercial conditions. Hunt was writing a specification that would be practicable, considering the ores that the Western mills can get.

In silicon we see an interesting difference. Hunt specifies *not less* than Si. 0.10, while Dudley specifies 0.10 to 0.15. But the Indian specifications call for *not more* than Si. 0.06. Dudley says that Si. 0.04 to 0.06 is not enough for present practice; and steel makers in this country have generally, we suppose, recognized silicon as a useful element, not only as a hardener, but in getting a sound ingot.

There are various other particulars in which the rail maker and inspector will be interested to compare the Indian specifications with American practice. For example, the Indian inspector will accept but 6 per cent. short length, and permits a variation of but ¼-in. above or below. Here the common practice is to accept 10 per cent. of short lengths, and permit ½-in. variation. In the matter of treatment of ingots and blooms, Mr. Hunt is undoubtedly in advance, not only of the English but of most of our own engineers.

On the whole we do not see that we have much to learn from the English in the preparation of rail specifications, but Mr. Leighton may be right in supposing that they get better rails.

The Speed of our Warships.

Admiral Ramsey, U. S. N., has made a remarkable discovery. He has ascertained that the ships of our navy never reach, in cruising, the record speeds of their trial runs. He has collected the speeds made and coal burned on all voyages of all ships in the last official year and has discovered that the trial records are "altogether meaningless as indicating the value of such vessels for every day naval use." At least the Washington correspondents of some of the daily papers say that he has discovered this; but we suspect that they put the words into the Admiral's mouth. We cannot imagine that he is surprised to find the cruising speeds far below the trial speeds or that he has said that the trial records are meaningless.

Some of the facts reported are: The New York,

rated at 21 knots, best run for the year, 685 knots, at 15 knots an hour; average for the year, 10 knots. Columbia, 22.8-knot ship, New York to Southampton at 15.5 knots an hour; returned at 18 knots. Minneapolis, 23.07-knot ship, best run for the year, 14.3 knots, Norfolk to New York. Baltimore 20.1-knot ship, best speed for the year 12.7 knots an hour for 212 knots. Well, what of it? Do these and similar records show that "fast warships are a delusion," as one discerning head-line editor puts it? Do they show that the trial records are "altogether meaningless?"

Every one knows that a ship never cruises under full power; and to compare the average cruising speed with the trial speed is comparing the incomparable. The two speeds need not have any relation to each other; ordinarily they would have, but not necessarily. One might just as well compare the year's road record of a horse with the speed he made at the county fair; or the 10 miles an hour of a bicycler on his long road journeys with his mile in three minutes on the track. The comparisons would be entertaining for a moment, but of no earthly use.

We doubt very much if the Admiral reasons from the figures collected that record trials are useless or that we should cease to try to build fast ships. The record trials are the basis for the comparison of speeds of our ships with each other and with those of other nations. To make the basis as nearly absolute as possible the conditions must be as nearly uniform as possible - which means the best possible. If they are not so then we have no measure of comparative speed.

If we build war ships at all, presumably they must be fit for war—which means that they must be fast when speed is wanted. Speed is wanted not only in flight and in pursuit, but it is wanted very much indeed in the few trying hours or perhaps minutes of engagement. No one has yet said just why the Japanese won at Yulu; but the average speed of their fleet was two or three knots higher than that of the Chinese; they sailed right around their slower antagonists. No doubt this element of superiority had as much to do with winning the victory as better gunnery or more pluck; perhaps it was the really deciding element. At any rate the proposition to quit trying to build fast ships is too absurd to discuss, if it is admitted that we ought to build any more warships now. That is altogether another question.

The Air-Brake on Freight Trains—A Chapter of Experience.

During the past few years the *Railroad Gazette* has frequently expressed the belief that, when air-brakes were applied to enough freight cars to enable trains to be entirely controlled by the air-brake, economies would result that would more than compensate for the air-brake investment. We have never had any doubt of the soundness of this view; but, the application of air-brakes to freight cars has been gradual, the use of the air-brake in the control of freight trains has grown by degrees, and the benefits have therefore generally not been so distinctly marked as to permit comparisons to be made. It has been impossible to get statistics of the economy due to the use of the air-brake on freight trains and very little definite information concerning the subject has been collected.

It is true that when the Atchison, Topeka & Santa Fe changed from the use of the hand-brake to the air-brake on freight trains some years ago, particular attention was paid to the effect on the number of wheels destroyed in service, and it was found that the cost of wheel renewals was reduced about 20 per cent. This is an important item in the economy of the air-brake, due to the uniform distribution of the retarding force over a large number of wheels instead of concentrating it upon a few, as has been the custom with the hand-brake, and many have believed that the saving in the cost of wheel renewals alone would justify the expense of applying the air-brake to freight cars. But this is only one of the several economies which are already known to result, in a greater or less degree, from the use of the air-brake on freight trains, and it is therefore with great satisfaction that we can now publish definite information in this direction, especially as it comes from a source of unquestionable reliability.

About two years ago the officers of the New York Central & Hudson River Railroad concluded that it was time to begin to realize some practical economy from the large sum that had already been invested in freight brakes. It was decided, but not without serious misgivings on the part of some of the officers, to require that a sufficient number of air-braked cars for full control should be placed at the head end of every freight train, and that the number of brakemen on all through freight trains should be reduced to two. This, we believe, is the first case where any Eastern railroad has undertaken such a radical step, and the interesting and instructive results reflect great credit on the progressiveness of the New York Central management.

The effect of this order has been that all through freight trains on the New York Central have been controlled by the air-brake to the exclusion of the hand-brake during nearly two years. The saving in operating expenses resulting directly from the reduction of the number of brakemen has amounted to more than $95,000 a year. No increase in the number of inspectors or yardmen has been found necessary, and the only added expense, in any degree offsetting this saving, is the cost of maintenance of the air-brake equipment. The entire cost of repairs and maintenance of the air-brake equipment on the New York Central freight cars is about $26,000 a year, so that the net reduction of operating expenses, in this one direction, has been more than $69,000 a year.

The additional cost of applying the air-brake to new cars has averaged about $49 a car. The average cost of applying the air-brake to old cars, many of which had to be supplied with new brake rigging or parts of brake rigging, has been $65 a car. As the number of new cars to which brakes have been applied is fully as great as the number of old cars, it is fair to say that the average cost per car has not exceeded $57. At 5 per cent., $69,000 (the net saving in wages) is the interest on $1,380,000, which, at $57 a car, would pay for the application of brakes to more than 24,200 cars. The total number of New York Central freight cars equipped with the air-brake is less than 19,000; so, deducting $54,000 for fixed charges on the air-brake investment, the net earnings of the railroad are increased, on account of reduced wages of brakemen alone, by at least $15,000 over and above all cost of repairs and maintenance and fixed charges on the air-brake investment.

In addition to this, however, a surprising reduction in the cost of accidents has been effected simultaneously with the inauguration of the control of freight trains by the air-brakes. The total number of accidents immediately increased, which was largely due to the effects of rough handling upon draw gear; but the total *cost* of accidents immediately began to decline. The number of accidents has since then been reduced one-half and the cost of accidents has declined 65 per cent. It would be entirely unfair to attribute the great reduction in the cost of accidents entirely to the use of the air-brake on freight trains, as the introduction of a thoroughly modern and complete block signal system has unquestionably contributed very materially to this end, and improved equipment and better discipline have doubtless aided. It would be impossible now to determine with reasonable accuracy the proportions in which credit should be divided between these two safety appliances; but it seems reasonable to believe that a good deal of it is due to the air-brake.

The system of operating all through freight trains by air-brakes has also been extended to the West Shore Railroad and within the past year the average speed of all freight trains on that road has, in consequence, been increased 30 per cent This has resulted in proportionally increasing the volume of traffic which can be handled under the block signal system on the same number of tracks, and it likewise permits the same volume of freight to be handled with about three-fourths the number of train crews.

There is not much reason to suppose that the sentiment which resulted in the law compelling railroads to apply air-brakes and automatic couplers had its root in a keen desire to promote the welfare of the railroads; but, in view of these practical benefits already obtained from the use of the air-brake, there seems to be little doubt that the effect of the law will ultimately be a material increase in the net profits of the railroads. It is almost certain that any railroad which can borrow a sufficient sum to equip its freight rolling stock with air-brakes, would best serve the interests of its stockholders by doing so as quickly as possible.

Disposition of Scrap Iron.

The subject of utilizing scrap material that accumulates at different railroad shops has been discussed in the columns of the *Railroad Gazette* before, but an extract from the report of the committee on the Utilization of Scrap Material at the last annual meeting of the Master Blacksmiths' Association showing how the Southern Pacific Railroad deals with their scrap is interesting.

In 1880 the accumulation of scrap iron at the Southern Pacific shops at Sacramento, Cal., was very important as the price of iron was higher than at present, and there was little market for the scrap. A small rolling mill with a single train of 12-in. rolls was constructed with the idea of working over the old scrap and from the report of the foreman of the blacksmith shop it has proved very useful. Material which has been in use for some time, subject to heavy strain and severe shocks, is cut up into short lengths and stacked into 200 lb. piles. It is then placed in a blooming furnance and after being brought to the proper heat is put under a steam hammer and forged into billets or slabs. These are again cut up, repiled, and subjected to the same treatment as before. This time they are forged to the proper dimensions for use in the locomotive, car or track departments. Some of the billets are rolled in their mill into such shapes as to supply bar iron, fish plates, spikes, bolts, nuts, etc. The annual output is from ten to twelve thousand tons. The cost is about ½ a cent per pound.

All good iron that comes in with the scrap is cut up into such lengths as is required for car repairs, etc., but all iron that has been bent to a sharp angle is worked over again.

Old car axles are rolled into bars 6 in. × ¾ in and cut up in 3 ft. 6 in. lengths. These plates are collected in sufficient quantities to make new axles. This method is considered better than flattening the old axles under a hammer, cutting them in the center and re-piling them.

Ssteel rails are converted into brake beams by plating out the head of the rail to the same thickness as the web, thus making a T section. This is then sheared to the shape required.

The Best Railroad Speed Records.

The business of "record breaking" is now being carried on by the railroads so vigorously that it will soon become a difficult matter to keep track of the new records by which the old ones are broken every few weeks. Indeed it would take a pretty large sheet even now to contain all of the excellent records which the men who performed them would like to have entered in any statement of this kind. As a partial guide in keeping track of these "events" we have compiled the table which accompanies this article. It shows little except the mere speeds and, in the last few items, may be subject to some slight correction. These items may very reasonably be open to some dispute, as the fast runs for long distances that have been made in England and this country the present year have undoubtedly included many short "spurts" at very high speeds. For instance, the train of the Lake Shore & Michigan Southern which made such a fine record on Oct. 24, is said to have run four miles at 92 miles an hour at least twice east of Erie.

As nearly all of the highest records have been made on comparatively level and straight roads the principal factor in most of the comparisons is the locomotive. This factor is so variable that a discussion of it does not come within the scope of this article. Some of the best runs for short distances have been made, as appeared by the table printed in the *Railroad Gazette* June 2, 1893, by compound locomotives, and the relative merits of compound and simple engines were a feature of the discussions of the fast runs of 1892 and 1893.

It will be seen that all of the best records for distances under 1,000 miles have been made during the last two and a half years. The Jarrett & Palmer train was an advertising scheme of theatrical managers. This train is notable as having run 439½ miles, from Jersey City to Pittsburgh, without a stop, and at good speed. This fact seems to have been forgotten in some quarters, as we have noticed published statements in which the recent run on the London & North Western of 300 miles without a stop is spoken of as the longest trip of that character ever made. The transcontinental train of 1876 is also notable as having been hauled from Ogden to Oakland, 881 miles, by one engine, run by one engineer, Mr. Henry Small. The newspapers just now are printing notices of the new Sunset Limited train of the Southern Pacific, which twice a week runs through from New Orleans to San Francisco in 77 hours, 45 minutes (the distance is 2,489 miles, making the rate of speed 32 miles an hour), and this train is spoken of as the fastest ever run for such a long distance; the statements should be amended so as to read the fastest *regular* train. The new train of the Atchison, Topeka & Sante Fe runs from Chicago to Los Angeles, 2,265 miles, in 74 hours, 5 minutes (average 30. 5 miles an hour). The Atchison people evidently take some credit for doing this every day instead of only twice a week, and as the grades are heavier and the train is less exclusive, it is quite possible that the Atchison's performance is as good as the Southern Pacific's.

The second item in our table refers to the regular time of the Exposition Flyer, which was kept up during the whole of the summer of 1893. This was a pretty heavy train, and, in view of its weight, probably made some of the very best speeds for long distances ever recorded, as, on some occasions when it was detained, time was made up.

The fourth item, representing the time of the best English run, is probably to be classed as that of a regular train, though the omission of stops and reduction of the number of cars in the train modified the conditions so much as to make the comparison with most regular trains somewhat unfair. The fifth item, the best high speed record ever made for a distance so long as to require a change of engines, was made, as we have already stated, on a very favorable course, or at least one that was favorable on the day when this record was made. The best New York Central record comes within seven hundredths of a mile an hour of this one, and the best English record within 37. The English run was a little longer and the New York Central a little shorter, but these three are on a pretty nearly equal basis, so far as mere distance is concerned. The performances of the

East Coast line to Scotland, in its competition with the London & North Western, also deserve mention; for, although the speeds were not as high, the stops, the difference in weights and other conditions largely or wholly explain the superiority of the West Coast (L. & N. W.) Line.

The sixth item, that of the newspaper train which was run from New York to Syracuse in September last, represents the best record for a single run without a stop. The rate of speed made by this train has been maintained for shorter distances on the New York Central many times before, and it was almost equalled as far back as 1881 on the Canada Southern (now the Canada Division of the Michigan Central) when the Fontaine locomotive, having multiplying wheels for drivers, ran 111 miles without a stop. About the same rate was made by the broad gage engines on the Great Western of England half a century ago (1848), the distance being, however, only 53¼ miles.

The notable fact about the seventh item is that the driving wheels of the engine were only 5 ft. 8 in. in diameter, the other fast runs on the Lake Shore and the New York Central having been made by engines with wheels 6½ and 7 ft. in diameter. It is to be remembered, however, that the very high speeds that have been common on the Philadelphia & Reading for the last 11 years have been made by engines with wheels of this size.

The eighth, ninth and fourteenth items are given on the responsibility of Mr. H. P. Robinson, who was on the train. The run represented in item 12 was nearly equalled on the Lake Shore by the 10-wheel engine with 68-in. drivers, and with a much heavier train.

When we come to speeds above 90 miles an hour, the records which are perfectly clear, having been observed and written down with the best attainable precision, are very few. The Pennsylvania claims one which is better than this, but we understand that the figures were taken from the train dispatcher's sheet, in which no care was taken to record the time any closer than even minutes. A speed nearly as good as this (98.4 miles an hour) was made on the Reading as long ago as 1890, and with a 68-in. wheel. We publish the last item now, as heretofore, for what it is worth. We have never seen any very precise statement of it from officers of the New York Central & Hudson River road, but it appears in publications issued by the passenger department, and so we suppose it is to be accepted as a record until challenged. This record was made on a descending grade with a train of four cars.

HIGHEST SPEEDS OF RAILROAD TRAINS FOR VARIOUS DISTANCES.

	Date.	Railroads.		Dist.	Time.	Speed incl. stops.	No. stops.	Weight of cars.	REMARKS.
				Miles.	H. M. S.	M. P. H.		Pounds.	
1	June 1-4, 1876.	Penna.; P., F. W. & C.; C. & N. W.; U. P.; C. P.	Jersey City to Oakland.....	3311.	83 45 0	39.53	.	.....	Jarrett & Palmer's special train.
2	May, 1893....	N.Y.C.& H.R.; L. S. & M. S.	New York to Chicago.....	964.	19 57 0	48.20	10	.....	Regular train.
3	Oct. 24, 1895...	L. S. & M. S.; N.Y.C. & H.R.	Chicago (100th st.) to New York.	952.	17 45 0	54.20	10	.....	Regular train, Buffalo to N. Y.
4	Aug. 22-23, 1895	L. & N. W.; Caledonian.	London to Aberdeen.....	539.75	8 32 0	63.24	3	150,080	Rate excl. stops 63.93.
5	Oct. 24, 1895....	L. S. & M. S....	Chicago (100th st.) to Buffalo, (Buffalo Creek Station).....	510.10	8 1 07	63.61	5	304,500	Special train* Rate excl. stops 65.07.
6	Sept. 25, 1895..	N. Y. C. & H. R.	Albany to Syracuse.....	147 84	2 10 0	68.23	0	167,107	Specia train
7	Oct. 24, 1895..	L. S. & M. S....	Erie to Buffalo Creek.....	86.	1 10 46	72.91	0	304,500	" " *
8	" " "	" "	Between Erie and B. Creek	75.	1 0 0	75 00	0	304,500	" " **
9	" " "	" "	" "	59	.....	76.08	0	304,500	" "
10	Apr. 21, 1895..	Camden & At...	Camden to Atlantic City.....	58.30	0 45 45	76.46	0	65,000†	" " **
11	" " "	"	Liberty Park to Absecon.....	49.80	0 37 30	79.70	0	65 000†	" " **
12	" " "	"	Berlin to Absecon.....	35.60	0 25 45	82.90	0	65 00.†	" " **
13	" " "	"	Winslow J. to Absecon.....	24.93	0 16 00	83.00	0	65,000†	" " **
14	Oct. 24, 1895..	L. S. & M. S....	Between Erie and B. Creek.....	8	.....	85.44	0	304,500	" " **
15	May 19, 1893...	N. Y. C. & H. R.	Looneyville ——.....	5.00	0 3 00	100.00	0	326,000	Regular train **
16	May 11, 1893...	"	Grimesville ——.....	1.00	0 0 32	112.50	0	326,000	" " **

*Train did not stop at Buffalo Creek.
**Did not stop either at starting point or terminal.
†Estimated weight.

It bothers the *Railroad Gazette* to account for the putting on of the new 5½-hour Boston-New York train by way of this city, when the New Haven company had withdrawn one Shore Line train in order to help the new 5-hour limited over the Air Line. It says the Air Line train was not needed, and is an attempt to stimulate business rather than meet an existing demand. . . . Railroads are chartered and operated first for the public convenience, and if such convenience is met by a 5½-hour train between New York and Boston by way of the Albany road, we don't imagine the New Haven road in the end would be permitted a wide option on whether the train should be hauled over any of its road or not. But the new arrangement is interesting as showing that the New Haven company is not disposed to attempt the freezing out of the Albany road from the New York passenger traffic. Its management is enlightened enough to believe that all business is to be welcomed, from whatever source it comes.—*Springfield Republican.*

That *if* would seem to indicate that possibly the *Republican* is as much perplexed as ourselves. If Springfield and Worcester have no greater demand to make upon these railroads than that two trains be run within half an hour of each other, their sufferings for the lack of railroad facilities cannot be very great. We are not bothered to account for the Springfield Line train; it has to be run to meet the conditions of the contract between the two roads; but it would bother any one to discover the wisdom of the details of the arrangement. The new Air Line train is to stimulate business over the New Haven lines (in which the New England is now included) and the retention of the Shore Line train, starting at 3 o'clock, the most popular hour of the day, is for the same purpose; but the running of a second Boston & Albany train at noon (not a popular hour) would seem to accomplish but little besides the division of the 11 a. m. train. Why do not Springfield and Worcester go in for a 5½-hour train to start from New York at 5:30 p. m.; or at 2 p. m.—some hour when the train would be a real addition to the accomodations?

A strike of American Railway Union employees on the Great Northern Railway was reported from Spokane last Saturday, and at Kalispell, Mont., some engines were taken out of the roundhouse and run off the track. A turn-table was blocked and five men were subsequently arrested. At Columbia Falls a bridge was burned, and it is said that the fire was incendiary. It does not appear from the reports, however, that any considerable number of enginemen, conductors or trainmen left their work, and no serious delay of trains is mentioned in the newspaper accounts. From the tenor of other press items that have been published lately about Debs and his Union, it looks as though this strike may have been ordered chiefly as a feeler, to test the temper of the public. Nothing is said about the reasons for the strike, and it began with violence. Debs seems to have been working very industriously lately, and at Birmingham, Ala., and other places "Labor" has made arrangements to have a celebration on Nov. 22 when Debs gets out of jail. New branches of the American Railway Union have been formed in various places, one of 200 members being reported in Brooklyn, N. Y., last week. The membership seems to have been made up in this case from employees of the elevated and surface street railroads of all kinds, electric, steam and horse. A Terre Haute dispatch says that commercial telegraph operators will now be admitted to the union, and there seems to be a well-defined intention of taking in everybody that can be got hold of. Probably we shall see a "demonstration" some day if mere numbers will enable Debs & Co. to set it agoing. The Terre Haute dispatch says that the union is now more secret than formerly.

To those who know the chief engineer of the New York Dock Department the suggestion that he ever paid anyone a cent to get or keep his position is laughable. That gentleman is by descent, by education, and by association chock full of the finest and most resolute professional spirit. In matters of professional honor he is almost quixotic; and he is about the last man in New York whom any person of discretion would undertake to bully or to buy. That he has been able so long to do his duty well, and to keep his name unsullied, is, when we consider his surroundings, astonishing. We may add that the city has been most fortunate in retaining his services so long, and it would be little less than a calamity to lose him now.

It is estimated by railroad men and millers in the Northwest that in the three months that have elapsed since the wheat crop came on the market the Northwestern farmers have disposed of fully 80,000,000 bushels, or nearly half their crop. It is believed that the North western wheat crop was fully 190,000,000 bushels, much more than previous estimates. Of the vast marketing, 49,000,000 bushels have been received at Minneapolis and Duluth; country elevators hold 10,000,000; country mills have ground as much, and nearly as much more has gone to Chicago. Minneapolis alone has received 39,106 cars in the 90 days, the greatest average ever known.

NEW PUBLICATIONS.

Modern Examinations of Steam Engineers; or Practical Theory Explained and Illustrated. By W H Wakeman. Bridgeport, Conn.: American Industrial Publishing Co., 1895. 272 pages, octavo. Price $2.

The author explains that the purpose of this work is to give information to those engineers who wish to qualify themselves to pass examinations and take out licenses to run stationary engines. He has aimed therefore to make a work treating in a plain, practical way of a great variety of subjects pertaining to the engine and boiler room, and to give information for those who aspire to become competent engineers and something more than mere starters and stoppers. For the purpose undertaken the book seems to be very well designed and carried out, and the engineer who masters it will not have much trouble in getting his license. The information is elementary, simply presented, sufficiently complete, and, so far as we can judge from a limited examination, not at all misleading. The volume is made complete by two indexes. One of these gives 300 questions, each question numbered, and opposite to it is a reference to the page on which the information will be found which will enable one to answer this question. The other index is alphabetical, arranged by topics, each topic followed by the number of the question referring to it in the list of questions and by the number of the page on which the topic is treated.

Pocket List of Railroad Officials. Fourth quarter, 1895. New York: Railway Equipment and Publication Co., 326 Pearl street. Price $1 a year.

We have so recently described the plan and execution of this very complete and convenient guide that it is unnecessary to go over the ground again. We will merely add that it is published every quarter, thus bringing the lists up as near as possible to date. In the fourth quarterly issue just received a change in the arrangement of names has been made. The list of the officers of each railroad company has been divided into departments, which appear in the following order: (1) Executive, financial and legal; (2) Accounting; (3) Purchasing; (4) Traffic and claim; (5) Operating; (6) Telegraph and signals; (7) Mechanical; (8) Engineering, bridges and roadway. This re-arrangement makes the lists convenient to consult, and in case of the larger systems the names of these departments are inserted as sub-heads under the name of the railroad system. In fact the whole typographical arrangement is designed with careful consideration of the convenience of the user.

Car Lubrication. By W. E. Hall, B. S., M. E. Second edition, revised. New York: John Wiley & Sons, 1895. 73 pages, with illustrations. Price, $1.

The first edition of Mr. Hall's little book was published in 1891. The second edition is enlarged by the addition of a report of experiments made by Mr. Chabal on the lubrication of axle-bearings on the Paris, Lyons & Mediterranean Railroad. Furthermore, the author in forms us that a number of typographical errors have been corrected, and we observe a number of changes in the text which serve to qualify or amplify the author's meaning. We reviewed the book at considerable length when the first edition appeared, which review will be found on page 619, *Railroad Gazette*, 1891.

The Atchison Receivers' Defense of Their Lower Rates on Long Hauls.

The various railroads that have been ordered to explain to the Interstate Commerce Commission why they violate the long-and-short-haul law, have generally made answers claiming that the peculiar conditions which were created by the secret cutting of rates were such as to warrant them in assuming that the Commission would regard as justifiable the legal issuance of tariffs which ignored the long-and-short-haul clause. The Atchison, which was the first to file with the Commission reduced tariffs ignoring the fourth section, made an answer which opens by reciting the fact that the Receivers are operating the road under orders of the Circuit Court of the United States, and "that while said properties are in the management of said Receivers they are charged with the duty of preserving the same and preventing deterioration or waste therein, and that it is incumbent upon the Receivers not only to maintain the physical condition of said properties, but also, so far as possible, to protect their traffic and business." They admit the establishment of certain rates on the carload classes on freight from Chicago, etc., to Colorado common points, less than to intermediate points on the same lines, but state that it is not true that said roads charge lower rates on coal and other commodities, from eastern points to Missouri River points, than to localities nearer by. In respect to the Colorado tariffs, they say that "they are advised and believe that the rates so established are not in violation of the fourth section, or short-haul clause, of the act to regulate commerce."

After stating that they have, during their operation of the properties, observed the requirements of the Interstate Commerce law in the maintenance of equal rates, without discrimination, and in accordance with their established tariffs as required by the law, they state that prior to Oct. 7 the traiffs covering Colorado carload traffic were alike by the various all-rail routes competing for the business; that the competition became extreme and assumed the characteristics of a rate war; that thereupon, on Oct. 7, a reduced tariff was made effective, which was duly filed with the Commission, and the other lines reduced their tariffs to correspond; that the rate war apparently still continued and a second tariff was issued (Oct. 14) naming still lower rates; that in connection with making these reductions the rates on certain commodities, which were practically the only commodities moving in carload lots from eastern Kansas points to Colorado, were reduced to the Kansas City basis and a supplement to the tariff issued, which protects the citizens of Kansas under the short-haul rule in carload shipments to Colorado markets. The attention of the Commission is called to the fact that the reduced rates were not regarded as fair compensation for the services performed and that a notation to this effect was placed on the tariff, "in the nature of a protest against the use

thereof as a standard of comparison in the establishment of through or local rates; and said notation further stated that said rates were forced by excessive competition of other lines."

They further say that, by inadvertence, the rate established from Chicago to Colorado on Class A was made two cents lower than the rate in existence from Chicago to Kansas City, but this was not discovered until some time after the publication of the tariff. The error would have been at once corrected but for the fact that, when it became known, a general restoration of said non-compensatory tariffs was under consideration and about to be made.

The Receivers then state that they believe that the tariffs in existence to intermediate points, not affected by the reduced tariffs, are no higher than is just and reasonable for transportation to such intermediate points. They go on to say that in issuing the reduced tariffs two principal objects were in view, the immediate object being the protection of the Atchison against unjust and unwarrantable depletion of its traffic, and its shippers against the destruction of their business; and the ultimate object being to compel all lines engaged in said rate war to promptly place the entire carload traffic in question upon a non-remunerative basis, to the end that a speedy restoration of rates might be accomplished, with reasonable assurance of their future stability; the latter and principal object being in support of the interstate commerce law, in respect to its most important requirements, and in aid of the beneficial objects proposed by its second, third and sixth sections."

They then say that all lines immediately reduced their rates to the basis established by the last reduction of the Atchison; that the effect of this has been to bring about a conference between the various lines in interest and an agreement for a general restoration to tariff rates on Nov. 17 to a basis 15 or 20 per cent. below the tariffs in effect prior to the rate war; that these tariffs will apply at all intermediate points and will terminate the alleged violations of the fourth section, if any such violation exists, but that they "are advised and believe that their action in the premises was not in violation of the fourth section, and that the true construction of the fourth section did not require them, in issuing said reduced Colorado tariffs, to reduce their intermediate rates, provided such rates in themselves were just and reasonable; that the circumstances and conditions under which the traffic is conducted are not the same at said intermediate points, where no competition exists, as at said more distant points; that the competition in question was uncontrolled by the interstate commerce law, although nominally subject thereto, and was entirely analogous to competition with foreign roads, with railroads not crossing state boundaries and with common carriers by water, not subject to said law, and that the rule stated in said section is not intended to apply, and by its terms does not apply, except in cases where the circumstances and conditions under which the business is conducted are the same."

Annual Report of the Second Assistant Postmaster General.

Mr. Charles Neilson, Second Assistant Postmaster-General, has made his annual report and submitted it to the Postmaster-General. For the year ending June 30, 1895, the expenditures for mail transportation, including foreign mails, amounted to $47,509,801, an increase of about $1,000,000 over the expenditures for the previous year. Some of the other statistics are:

Number of railroad mail routes	31,867
Number of star routes	20,530
Steamboat routes	132
Paid for railroad transportation (approximate)	$28,000,000
Estimate for same for next year	$29 000,000
Cost of wagon service, New York City (approx.)	$192,000
" " " Chicago	$48,500
" " " Brooklyn	$18,934
Number of railway post office clerks	7,045
Compensation of railway post office clerks	$7,194,220

Mr. Neilson looks favorably upon pneumatic tubes, one of which is in experimental use at Philadelphia, and expects soon to be able to recommend the construction of such a conduit in New York City, between the Post Office and the Grand Central Station at Forty-second street. Hauling the mails between these two points by wagon costs now $50,000 a year. The report recommends the establishment of four additional divisions for the rail way mail service; that the officers in charge of foreign mails be stationed at New York City; that the mileage of railroad routes be readjusted; that certain improvements be made in the construction of postal cars and that street cars carrying mails bear small flags indicating their character. Mr. Neilson holds that no one except a Government official should have authority to place upon a car the insignia of the official character of the car, and that this should not be borne by any car except when in actual mail service.

The department intends soon to take the mail bags from the European steamships arriving in New York harbor, at the Quarantine station, and to take them by a special vessel to the railroad stations in Jersey City and to other convenient landings for branch offices, etc., so as to avoid the long delay now incurred in taking all foreign mails to the General Post Office. Mails will be assorted on the harbor boat. Mr. Neilson recommends the application of civil service rules to all officers and employees under his charge.

A large part of the report is devoted to the street railroad mail cars, and the appropriation asked for this service for the coming year is $200,000. The experiments in the various cities, beginning at St. Louis, are reported at length. One of the most successful experiments was that in Boston, where all the electric street lines are under one management. Ten postal cars in that city now supply 12 stations by regular hourly service. Chicago will soon have enough cars to serve about half the city. The Postmaster of New York City has found it possible to dispense with 951 pouches daily since the establishment of the street mail car line on the Third Avenue cable railroad. This line runs near to a number of branch offices, and the mails of these offices are taken to and from the cars in an average time of two minutes, as compared with seven minutes formerly required to take the bags to the stations of the elevated railroad. In New York many of the branch stations are a long distance from the General Post Office, and the Postmaster deems the saving in time by sorting letters on the road the most important benefit of the change. If a letter mailed at Harlem to go north should, by mistake, be sent south (to the General Post Office), the clerk on the car, who soon discovers the error, sends the letter back northward by the first car he meets, thus saving two hours. In Brooklyn the street car service is now so extensive that wagons will soon be entirely abandoned, except for the route between the bridge and the General Post Office.

Mr. Neilson says that the street car companies, with only two exceptions, have treated the Government very liberally. He has had no regular appropriation, and has been able to pay (for space in cars) only such sum as could be spared from the mail-messenger fund. For transportation he generally pays no more than the wages of the motorman and conductor, in most cases less. Mr. Neilson thinks that, generally speaking, the cost of street car service will be only one-half that of wagon service. It is proposed, however, to continue the expenditures about as in the past and double the number of deliveries.

Details of Interlocking Apparatus on the Michigan Central.*

Mr. Miles, in opening, pointed out that in using a single line of pipe to operate both a switch and a lock the pipe is strained more than it ought to be, and he went on to argue that in many places separate pipe lines should be run where now only one line is used. The speaker also called attention to the fact that although interlocking inside of the tower, that is, interlocking in the machine, has been brought to a high state of perfection, the locking done outdoors is imperfect and unsatisfactory. Continuing, he said:

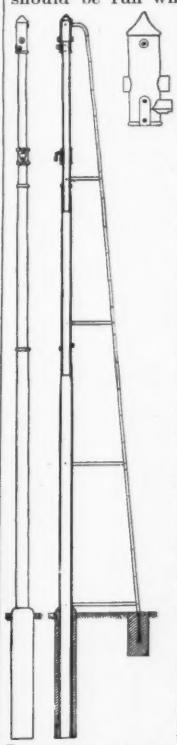


Fig. 6. Wrought Iron Signal Post.

The only way to detect the separation of the line between the lever and the switch where a switch-and-lock movement is used is for the leverman to notice the absence of load on the lever, which is certainly a very unreliable source of information. Further, the lock pins in a switch-and-lock movement are necessarily so short that when there is a little lost motion in the operating line, due to wear, the lever can be put "home" without the lock pin having entered the hole in the lock bar.

With such defects in the switch-and-lock movement it is apparent that it never should be used excepting when locked with the signal connection, or used on trailing switches or on side track switches where train movements are slow. If it were feasible all facing switches and derails in a high speed route should be bolt-locked by the connection that operates the signal. As such an arrangement is generally not practicable, those facing points that cannot be so locked should be protected by facing point locks.

The present practice on the Michigan Central Road, with which topic I will deal for the remainder of this paper, is to use facing point locks on all main line facing point switches and derails, also to lock them with the home and distant signal connections where convenient. Switch-and-lock movements are used on main line trailing points and side track switches and derails only; said points being locked by the connections of signals that govern them in the facing direction.

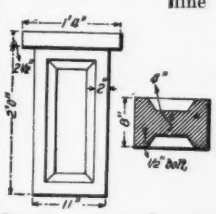


Fig. 3. Concrete Foundation for Signal Connections.

It was found that a switch-and-lock movement attached to a facing point switch was not safe, and further that such a movement, wire-locked with the home signal, was likewise open to danger. A series of tests established the fact that if a switch-and-lock movement failed to close the point, there was so much elasticity in the wire lead to the home signal, that the signal lever could be reversed without the home signal being cleared. This unlocked the distant signal lever, allowing the distant signal to be pulled to safety. To remedy this defect it was decided to wire lock the distant as well as the home signals with all facing point switches and derails that were not protected by facing point locks.

Mr. Miles then described a lock, to be operated by wire, used on his road. It can be placed close to the guide casting of the lock operated by the switch connection, and thus be worked in connection with the same lock. This wire lock may be two-way or three-way, and on the Michigan Central this device is now used to lock distant signals directly with switch rails.

To guard against a danger that a switch connection may break, allowing the switch lever to be moved without moving the switch rails, the Michigan Central has adopted, in lieu of something better, a spring centering device (Fig. 2) *A* which is attached to the head rod of the switch, causing the switch to be thrown to the middle position, in which position the lock pin cannot enter. While this device is not positive in action it adds greatly to the safety of the ordinary facing point lock and is cheap to construct and easy to maintain. The Saxby & Farmer duplex detector and the Turner facing point lock, the latter recently placed on trial by the Pennsylvania company, are positive in action and if proved reliable will solve the difficulty of this weak point in mechanical interlocking.

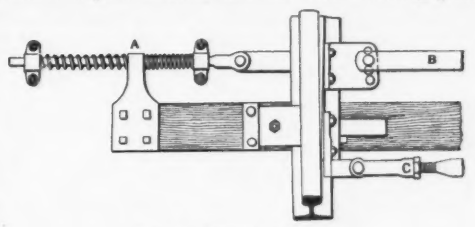


Fig. 2—Centering Device.

To get rid of the danger and inconvenience of lost motion in switch connections the switch rods on the Michigan Central are made adjustable, as shown at *C*, Fig. 2. The main rod connecting with the tower is attached to the tie rod *B*, and that also is fitted with nuts, so as to be easily adjustable. With this arrangement it is not only possible to maintain a much closer adjustment, but the expense of repairs is less than for switches with rigid connections.

Experience has taught that wooden signal poles must be spliced and wooden leadout foundations renewed in from four to six years after the installation of a plant, the life of the foundations depending to some extent upon the conditions of the soil. As such renewals are expensive, more lasting material was sought, and the efforts in that line have led to the adoption of concrete for all leadout foundations and iron poles for all signals. Our first attempt in this direction was in the erection of a drawbridge plant at Michigan City during the summer of 1892. All of the leadout foundations used in this place, excepting those used under pipe carriers, were made of concrete. On a recent inspection these foundations were found to be perfectly rigid, and apparently as sound as the day they were put in. As it had been the practice of signal companies for some time previous to cement all crank and compensator wooden foundations for the purpose of holding them rigidly in place, it was certainly no more expensive to cement iron bolts supporting a wooden top. Encouraged by our success, all of the plants, 13 in number, erected by the Michigan Central interlocking department, from that date until the beginning of 1894, were equipped in a like manner.

Being thoroughly convinced that wood was an unsatisfactory material for foundations, we decided to abandon its use for under work wherever possible. The 40-lever machine erected in the winter of 1894 at the crossing of the Lake Shore and the Michigan Central, at Porter, Ind., reaches a still more advanced stage in this direction. All foundations, including pipe carrier and iron signal pole foundations were made of concrete and all signal poles were made of iron, with the exception of two bracket poles used on the L. S. & M. S. The covering over the leadouts was made in eight foot sections and fastened down with lag screws, making it easy to remove in case it was desired to paint the pipe. Despite the fact that this plant had long pipe leads, and was erected in the winter, the total cost of it was only $250 per lever.

As pipe rusts very rapidly in some localities, even when painted, galvanized wrought iron pipe was tried. A 10-lever machine, installed at Kensington a year ago, was equipped throughout with galvanized pipe. While the test in this case has not been long enough to prove anything, we had used it previously to replace pipe that had been destroyed by brine, which had leaked from cars, and in the latter case we found it to be much more serviceable than common pipe painted. Of the reasons that have been urged against its use, one is that the threaded portion, which is the weak point, is not galvanized pipe. As all interlocking pipes are reinforced at the coupling, and as the pipe does not rust uniformly, but depends on local conditions, and further, as it costs but little to paint the couplings occasionally, I think that any fear on this score is groundless. Another criticism was that galvanized pipe was softer than ungalvanized pipe. To satisfy myself on this point, I had both wrought iron and steel pipes, galvanized, and ungalvanized, tested at the Pittsburgh Testing Laboratory. The compression tests show that both galvanized and ungalvanized wrought-iron pipe began to compress at nearly equal loads, while the ungalvanized shows the greater strength at the failing point. The steel pipe tests show that the galvanized pipe has the advantage, both at the point of compression and at the failing point. The tensile tests show that with wrought iron pipe the ungalvanized pipe has both the greater elastic limit and the greater tensile strength. With the steel pipe the elastic limit of each is about equal, while the tensile strength of the galvanized is the greater. The advantage, in any case, is so slight that there need be no hesitation about using galvanized pipe.

The concrete foundations for cranks, compensators chain-wheels and dwarf signals being heavy and unwieldly to handle, are made in the ground in the position they are to occupy in the lead-out. Boxes of the sizes required, and open at both ends, are made of rough 1-in. timber and placed in the ground. Bolts, ¾-in. × 30-in., are suspended in the box, and the moist concrete is put in and allowed to set; oak timber 4 in. thick is placed on top of the concrete before the latter is hard, and is held in place by the bolts that are imbedded in the concrete. The bolts project far enough above the oak timber to be utilized for bolting the base casting.

Following are the sizes of boxes used for the different foundations:

Compensator	18 in. wide	× 36 in. long	× 40 in. deep
Crank	18 " "	× 20 " "	× 40 " "
Wheel	14 " "	× 16 " "	× 36 " "
" 4 way P. R. R. st'd.	14 " "	× 30 " "	× 36 " "
Dwarf signal	12 " "	× 12 " "	× 36 " "
Selector	12 " "	× 12 " "	× 36 " "

A concrete foundation is used at each end of the foundation timber for dwarf signals and selectors. Where there is a cluster of cranks or chain wheels, or both, a single foundation is made of a size adequate to the requirements in each case. Four bolts are used for compensator foundations, and only two for the other foundations above specified. The pipe-carrier foundations are of a size convenient to handle, and are cast in molds. When hardened sufficiently they are taken from

* Paper by Mr. H. D. Miles before the Railway Signaling Club, Chicago, Oct. 8, condensed.

the molds and finished by the addition of an oak top. Fig. 3 shows the construction of the carrier foundation. Concrete foundations are made in long boxes holding 18 molds each. There are two standard sizes, 11 in. wide and 16 in. wide, the latter carrying from three to six carriers. The size of the oak top is varied according to the number of carriers. When larger than six way carriers are needed, two 11-in. foundations, an 11-in. and 16-in. or two 16-in. foundations, as the case requires, are placed side by side, and a single oak top is placed over both, each foundation being of the same height and thickness. Two ⅝-in. × 14-in. bolts are used for carrier foundations. The threaded end of the bolt projects downward through the bottom plank of the mold far enough to be of the length necessary to hold the oak top.

The concrete for all foundations is made of three parts of stone, two of sand, and one of imported Portland cement. The 11-in. foundation costs 45 cents, and the 16-in. 50 cents.

Our first iron pole erected was at Jackson, in the summer of 1895. This pole, for two arms, is made of four 1¼ in. pipes kept in position by cast-iron braces. The braces, base casting, and bearings for the semaphore arms, are held rigidly in place by babbit metal. The opening in the collars of castings through which the pipe passes is ⅛ in. larger in diameter than the pipe, and this space is filled with babbit metal. The base casting rests on a concrete foundation and is held in position by four 1-in. bolts. The single arm pole costs $42 and the double arm $54.

Another design of poles, Fig. 6, was erected at Marshall this summer. The pole consists of a single column of pipe made in three sections, which consist of six, five, and four-inch wrought iron pipe, respectively, the sections of pipe being held together by swedged joints. Both upper and lower castings are held in place by babbit metal. The balance lever casting *B* being made in the form of a divided collar, is clamped to the post. A sheet iron casing, 12 in. in diameter, is placed around the base of the pole and the space between the casing and pole is filled with concrete. This concrete extends above the surface of the ground and prevents the base of the pole rusting. Both designs of poles in use are very neat in appearance, and should be very durable, but as the single pipe post can be made for $10 less than the four-pipe post, it is naturally preferred.

I have attempted in this article to speak of that part of the practice of the Michigan Central that is not common practice. Of course, some of the methods and devices spoken of here were used on other roads before being adopted by the Michigan Central; but, as a great many roads use different methods, I felt that a statement regarding the reason for our practice was advisable, with the hope of determining from a subsequent discussion of the matter, what the best practice should be.

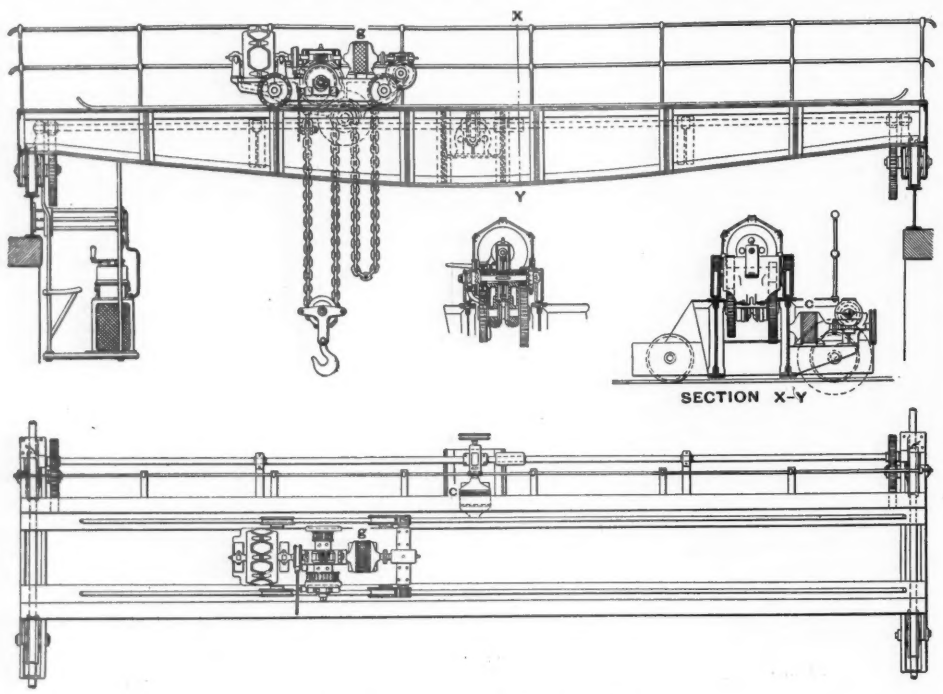
An Electric Traveler with Three-Phase Motors.

Three-phase current electric motors, built by the Oerlikon Works, Switzerland, are used for the operation of the famous machine shops of Escher, Wyss & Co., at Zurich. Power is transmitted to them 11 miles, 24 motors, aggregating 420 H. P. drive tools, ventilators, movable drills, etc., 38 motors aggregating 250 H. P. operate lifting apparatus of all kinds, among them five 20 ton, eight 10 ton and seven 5 ton cranes. To provide for a break down of the line a steam generator has been installed capable of driving the more important tools, etc.

A report on this installation in the *Z. d. Oesterr. Ing. & Arch. V.* contains some data regarding the use of three-phase motors on traveling cranes in shops. Ready subdivision is the great boon of the employment of electric power. It is, therefore, considered bad practice to install only one motor for the three directions of motion of the traveler. It would needlessly complicate the mechanism, and diminish the ease of manœuvering the traveler. The motor would be worked part of the time, during longitudinal and transverse motions at only $\frac{1}{10}$ to $\frac{2}{10}$ its capacity, and consequently at a low average efficiency.

The Oerlikon Works install one separate motor for each direction of motion, equipping, for instance, a 35 ton crane with one motor 18 H. P. for lifting, one motor 4½ H. P. for transverse motion, one motor 9 H. P. for longitudinal motion. The motors are controlled from a suspended stand; they are started and reversed by one combination switch for each one. Resistances for speed regulation are not used. The motors have two distinct speeds which are as 1 : 2, sufficient for all practical purposes. The motors are running at about 1,000 revolutions per minute. The reduction of speed is effected by gear-wheels or worm gear. Worm gear and motor are connected by an elastic or non-rigid coupling, a friction pulley in the case of the lifting motor, which can be thrown in by the motorman and also by means of a light chain from below.

In the accompanying drawings, which are taken from the French *Revue Industrielle*, *c* indicates the motor for longitudinal motion, *g* the one for transverse motion and the one for lifting.



An Electric Traveler, with Three-Phase Motors.

TECHNICAL.

Manufacturing and Business.

The Virginia Bridge & Iron Co. was incorporated at Richmond, Va., last week, with Samuel Walton, of Tazewell, President; C. Edwin Michael, of Roanoke, Secretary and Treasurer, and Charles C. Wentworth, of Roanoke, Chief Engineer. This company has purchased the plant of and succeeds the American Bridge Co., whose works have been idle since March. The plant will begin operations in two weeks. Some contracts have already been secured.

The Pennsylvania Bolt & Nut Co., Lebanon, is now employing 1,300 men and is doing the largest business in its history. It is building an important extension and adding new machinery.

The Buckeye Malleable Iron & Coupler Co. has just received orders to equip the passenger cars on the new Wellston & Jackson Belt Railroad, in Ohio, which is to be operated by electricity and steam, with the "Little Giant" Buckeye coupler.

The Lowe Bros Co., of Dayton, O., manufacturers of paint, report sales in their railroad department having doubled during the past year, and that the present sales and the outlook for future business are excellent.

The General Railway Equipment Co., incorporated, with office in the Rookery, Chicago, has been formed for the purpose of handling heavy railroad supplies. The company has taken the agency for the Shickle, Harrison & Howard Iron Co., the Pencoyd Iron Co., the Bucyrus Steam Shovel & Dredge Co., the Pioneer Rail Renewing Co., the Wellman Steel Co. and other firms. The officers are Harlow N. Higinbotham, President; James H. Long, Treasurer; Eliphalet W. Cramer, Secretary; and Harry M. Higinbotham, Assistant Secretary.

J. A. Fay & Co., builders of wood-working machinery, Cincinnati, O., report that they are doing an extremely large business in their railroad department, and at present are building machinery for the entire equipment of the Big Four shops at Wabash, Ind., also for the shops of the Cincinnati, Jackson & Mackinaw at Van Wert, O., and machinery for several Eastern railroads. Their foreign business is growing rapidly.

The Big Four Railroad has recently purchased of the Cincinnati Milling Machine Co., one of the new improved heavy universal milling machines made by that company.

The Goodwin Car Co. is preparing designs for a new dump car under the Goodwin patents, and will probably get an order for some of these cars from the Calumet & Blue Island Railroad.

The Colwell & Collins Bolt Co., of Cleveland, filed articles of incorporation in Ohio last week, to deal in iron and steel nuts and bolts. The capital stock is $35,000, and the incorporators are A. L. Colwell, C. E. Collins, H. R. Collins, H. A. Garfield and E. C. Collins.

Anderson, DuPuy & Co. have erected an addition to their plant at McKee's Rocks, Pa, for the manufacture of tools, principally for railroad shops and railroad work.

Mayor Elliott and W. H. Loomis, for thirteen years proprietors of the National Paint Works, at Williamsport, Pa, have dissolved partnership, the latter retiring in order to devote his whole time to other business interests.

New Stations and Shops.

The work of re-establishing the Grand Trunk shops at London Ont., which had been removed to Brantford and Toronto, will begin at once. All the car building west of Montreal will be done at London. The shops at Point Edward are to be abandoned.

The Southern Railway has purchased a new site for shops at Alexandria, Va. This fact caused the renewal of the old rumor that the company's shops were to be removed from Manchester, Va., but its officers deny that the shops are to be removed from Manchester, which is just across the river from Richmond. The company will, however, build entirely new shops at Alexandria, and the old shops there will be abandoned.

The Chester & Lenoir road, operating between Lenoir, N. C., and Chester, S. C., will soon establish shops at Lincolnton, N. C. The town offered a site for the shops some time ago and the officers have decided to accept the offer, it is stated, and will soon do so formally.

Iron and Steel.

The Tennessee Coal, Iron & Railroad Company's Oxmoor Furnace No. 1, with a capacity of 200 tons of iron daily, was blown in last week after an idleness of two years. Two more furnaces at Ensley and Bessemer are also preparing to renew work soon. In an interview President Baxter says that the company sold during August and September 150,000 tons of iron. Inquiries and orders that are now coming in indicate that the demand will soon be greater than ever before.

The Canadian Government is about inviting tenders for 4,000 tons of steel rails; 1,000 tons for the Prince Edward Island division, to be delivered at Summerside; and 3,000 tons for the Inter-Colonial, to be landed at Point Levis, opposite Quebec. Tenders are to be in by December 17. The rails are required for renewals and ordinary repairs.

Tests of Car Wheels.

A series of comparative tests of car wheels was made by the P. H. Griffin Machine Works and the New York Car Wheel Works begining Nov. 8. These tests consisted in subjecting chilled charcoal iron wheels made from special mixtures to the tests required by the European roads for steel wheels, as follows:

Austrian State Railroad Test.—Wheel placed upright on heavy iron and stone foundation. Weight of 475 lbs. dropped from varying heights, commencing at one meter and increasing by half meters to six meters. Wheel must stand eight blows in all. Tests will be continued until wheel fails.

German State Railroad Test.—Wheel placed horizontally on heavy iron and stone foundation, tapering steel wedge placed in center. Weight of 440 pounds dropped from varying heights, commencing at one and a half meters, and increasing by half meters to four meters. Wheel must stand six blows in succession without breaking.

French State Railroad Test.—Wheel placed upright on heavy iron and stone foundation. Weight of 2,200 lbs. dropped from a height of four and a half meters. Wheel must stand three blows without breaking. Test to be continued until wheel fails.

Master Car Builders' Test.—Wheel placed horizontally on heavy iron and stone foundation. Weight of 140 lbs. dropped from a height of twelve feet. Required to stand five blows. Test to be continued until wheel fails.

These tests were made on wheels of the following grades:

Standard quality for American service 33 in., 600 lbs. M. C. B. specifications.

Special quality 30-in. engine truck spoke wheels, Lake Shore & Michigan Southern Railway standard, weighing 590 lbs.

Special quality 33-in. tender wheels, Lake Shore & Michigan Southern Railway standard, weighing 650 lbs.

Special quality 33-in. truck wheels, Michigan Central Railroad standard for 100-ton locomotive service, weighing 600 lbs.

Special quality 36 in. double plate passenger wheels weighing 750 lbs. M. C. B. specifications.

Special quality 950 millimeter (38-in.) double plate wheel, weighing 800 lbs. Austrian State Railroad specifications.

Special quality 965 millimeter (38⅛-in.) wheel, weighing 820 lbs. Hungarian State Railroad specifications.

Special quality 1,050 millimeter (42-in.) wheel, weighing 1,075 lbs. French State Railroad specifications.

Special quality 975 millimeter (39-in.) wheel, weighing 840 lbs. German State Railroad specifications.

Spoke wheels for electric service: Special quality 30-in. 325 lbs.; special quality 33-in. 350 lbs.; special quality 33-in. 400 lbs., all New York Car Wheel Works specifications.

Empire State Express Engines.

New York Central locomotive No. 870, which has drawn the Empire State Express from New York to Albany for four years, has now been running 17 months since it was last in the shop. It has run every week day since May 26, 1894, making 148,314 miles up to Oct. 18. During this time the engine has not been taken off the train or detained by any fault that could be attributed to the engine.

Engine No. 903, which came out of the shop April 3, 1894, has hauled the Empire State Express on one of the other divisions every week day from then until now, making 143,543 miles. During this time No. 903 has been detained twice by hot journals.

The Deep Waterways Commission.

Last Monday the appointment by the President was announced of the commission on deep waterways. The commission is to examine and report on the general subject of deep waterways from the great lakes to the sea. The Commissioners are Dr. James B. Angell, President University of Michigan; L. E. Cooley, of Chicago, and John E. Russell, of Massachusetts. Dr. Angell is an astute man, experienced in large affairs, not only the President of one of the greatest universities of the land, but distinguished as a diplomat. Whether or not

he knows much about transportation, or is much interested in a canal to the sea we do not know. Mr. Cooley is known to all the world as one of the ablest and most persistent advocates of improved waterways. He can be relied upon to hold up his end of the Commission. Mr. Russell is a lawyer and a politician, and may be highly qualified for this job; we know nothing to the contrary.

The North German Lloyd to Surpass the Campania.

The North German Lloyd Steamship Co. has placed orders for the construction of two steamers for the Atlantic service between New York, Southampton and Bremen. The agents of the company say that the ships will be as large as the Campania and Lucania, and that it is expected that they will make even higher speed. One vessel will be built by the Vulcan Steamship Company at Stettin and the other by the Schichau Steamship Building Co., which has yards at Elbing and at Dantzic.

The Nicaragua Canal.

The report of the Engineer Commission on the Nicaragua Canal was handed to the President Nov. 1. It is supposed that this will not be made public until it has been sent to Congress. Meantime, we are assured by the best possible authority that the press reports of the probable conclusions reached by the Commission are entirely speculative and are drawn from the imagination of the reporters.

The United States Audible Signal.

An audible electric signal for working an automatic block system has been in experimental use on the Chicago & Eastern Illinois for the past two months, and was tested near Chicago in the presence of a number of visitors on Oct. 26. The apparatus was devised by Mr. Elijah B. Cornell, and it is said that it has been tested in actual use through three severe winters.

The signals are given by a gong in the cab of the locomotive, which is set in operation by an electric current produced by a battery which also is on the locomotive. By means of brushes, rubbing on contact strips, fixed to the sleepers between the rails, electrical connection is made from the battery to the rails of the track in the block section ahead of the locomotive, but the circuit is not completed and the bell is not rung unless there is a car in the advanced section mentioned, or some metallic connection is made between the opposite rails.

Just before entering block section *A* the engine passes over a contact strip and by means of the brush, makes connection between the strip and the battery; the strip is connected by wire to the right hand rail of section *A*, and if there should be a car on that section the current would go to the brush, to the strip, to the right hand rail, through the wheels and axles, to the left hand rail, back to the engine (the left hand rail not being insulated at the ends of the sections), and back to the battery, closing the relay in the cab; the relay closes the bell circuit which remains closed until opened by the engineman. When the road is clear no circuit is completed, and no signal given.

Immediately after entering section *A*, or about 600 ft. after passing the contact strip mentioned, the engine passes over another contact strip which performs the office of a distant signal for section *B*., being connected therewith by a wire on poles.

On a single track road two sets of contact strips, right hand and left hand, are provided, and the inventor has a switch in the cab, operated by the reverse lever, by which he proposes to change the battery connection from the right hand contact-brush to the left hand whenever the engine is reversed. On the Chicago & Eastern Illinois the blocks are one mile long. The rails are electrically connected with switches in such a manner that the opening of a switch closes the circuit the same as would be the case if a car or train were in the section. The inventor proposes also to make suitable connection with the rails at telegraph offices, so that a signal can be given to the engineman to stop for train orders whenever it is desired to do so.

The United States Audible Signal Co. is being incorporated to make this apparatus.

THE SCRAP HEAP.

Notes.

The roundhouse and machine shop of the Louisville, New Albany & Chicago, at Chicago, were burned on Oct. 30, loss $20,000.

The severe drought throughout the state of Pennsylvania was relieved by copious rains on Oct. 31. The Pennsylvania Railroad had been compelled to carry water in cars to supply many stations.

The West Virgina State Board of Public Works has finished the assessment of railroads of the state for taxation for the present year. The total valuation is $22,432,791, about $5 0,000 more than last year.

Nine work train employees under 21 years old were discharged by the Pennsylvania Co., at Massillon, O., recently, and it is announced that henceforth minors will not be employed by the company in any capacity.

The New Jersey State Board of Assessors has finished the assessment of the railroad property of the state for the current year. The aggregate valuation, including canal property, is $221,576,221, an increase of $1,805,490 over the previous year.

It was given out last week that the Big Four would attempt to equal or lower the Lake Shore record for a long distance run, but subsequently it was announced that owing to the lateness of the season the attempt would not be made.

At St. Louis last month the Federal Grand Jury made an inquiry into the alleged illegality of the arrangement under which the old and the new bridges across the Mississippi River are now operated together, but no indictment was returned.

Several baggage cars of the St. Louis & San Francisco have been fitted with hooks, covered with plush, by which bicycles can be hung overhead and thus be safely and conveniently transported without occupying valuable room on the floor.

The Big Four Mutual Association, an insurance association of the employees of the Cleveland, Cincinnati, Chicago & St. Louis Railway, has recently held its annual meeting. It now has 1,388 members, a gain of 405 during the year. The President of the Association is Mr. J. Q. Van Winkle, General Superintendent of the road.

A man has been arrested in Michigan and is now in jail in Indiana who is said to have confessed to participation in the train robbery at Kessler, Ind., on the Lake Shore & Michigan Southern about two years ago. Another member of the same gang, who was shot and killed by detectives in a passenger train at Grand Rapids a few weeks ago, is now said not to have been one of the robbers who held up a train in Michigan, the crime for which he was being pursued at the time he was killed.

We are pleased to read in a Topeka paper that the railroads of Kansas have decided to abolish the long-standing custom of giving passes to men who wish to "go home to vote." It is to be presumed that this pretext for granting a pass has been recognized chiefly in the case of state officers, politicians, semi-politicians and their friends; but, so far as we can judge from this and previous items on the same subject, we are compelled to conclude that the classes mentioned have been stretched whenever necessary, so as to include almost any citizen of the state who is physically strong enough to vote, but too proud to walk.

The State Secretary of Internal Affairs at Harrisburgh, Pa., tells the reporters that 42 steam railroads and 70 street railroads operating in that state have neglected to file their annual reports for the year ending June 30, 1895, and he thinks of notifying the Attorney-General to collect the $5,000 statutory penalty from each company. Of the 70 street companies a good many are speculative concerns which probably will never lay any track; and Mr. Brown, the Deputy Secretary in charge of the railroad bureau, has three men traveling around the state trying to find out the condition of these alleged corporations.

A Big Tank Steamer.

The largest tank steamer afloat has been launched by Messrs. W. G. Armstrong, Mitchell & Co., of Newcastle. The "Nerile," as the vessel is named, was constructed to the order of Messrs. M. Samuel & Co., of London, and makes the twelfth vessel now possessed by that firm. She was built to the designs and under the superintendence of Messrs. Flannery, Baggallay & Johnson, of London and Liverpool, and is intended to carry oil to the Eastern ports, and general cargo homeward. She is constructed under the three-deck rule, and will be classed 100 A1 at Lloyds. The vessel will be lighted throughout by electric light, and the arrangements for rapid loading and discharging of cargo include two duplex pumps, of the Worthington make, for oil and eight steam winches for general cargo.

The Yankees Ought to Have a Hand In.

An order for 15 engines for the Cape Railways has been secured by Messrs. Sharp, Stewart & Co., of Springburn. The firm have in hand a contract for six engines for Japan. Messrs. Dübs have also obtained an order for the Cape Railways.—*Transport.*

The Manchester Canal.

Considering how steadily the passenger traffic on the Manchester Ship Canal has declined, it is not surprising that the shareholders of the Ship Canal Passenger Steamer Company, Limited, have resolved to wind up the concern. The object of the company was to conduct pleasure excursions along the waterway, but it is difficult to see what pleasure there can possibly be in a journey along such a malodorous waterway.—*Transport.*

Fast Torpedo Boat.

The *Moniteur Industriel* of October 12 reports the trial run of the French torpedo boat Forban at Cherbourg. It has 144 ft. length by 15 ft. beam, and 135 tons displacement. The specifications called for 29 to 30 knots per hour under full steam. In the trial run the engine indicated 3,250 H. P., and the boat had a maintained speed of 31.02 knots, that is 35.74 miles per hour.

The Bold Engineman.

An inspector writes as follows: "Upon calling at ——'s mill to make an inspection a short time ago, I found the safety-valve sent away for repairs! A blank flange had been bolted on in its place, and the engineer was going to run without any safety-valve until the old one had been repaired and returned. They were carrying from 60 to 70 lbs., and the boiler was rather old. I told the engineer not to fire up the boiler at our risk, as we would not carry it a single hour. He considered the matter a short time, and finally put on another valve before firing up."—*The Locomotive.*

Iron Ore Matters.

Shipments of ore from the Lake Superior mines have nearly ceased for the season, though three weeks of navigation remain. No exact figures can yet be given, but in all probability the different ports will close the year with shipments about as follows:

	Tons.
Escanaba and Gladstone (Lake Michigan)	2,000,000
Marquette (Lake Superior)	1,000,000
Ashland " "	2,400,000
Duluth and Two Harbors (Lake Superior)	4,100,000
Total	9,500,000

In 1892 these ranges, the Mesaba ranges contributing but a trifle, shipped about 9,000,000 tons, which was their highest record. At the opening of navigation, 1893, there were more than 2,500,000 tons on receiving docks at lower lakes, showing that the great production of 1892 was far above requirements. There was the same excess on docks at the opening of the following seasons. In 1895, which opened with a hope for the future, with large reserves and with extremely low prices, not only have there been greater shipments, by five to six per cent., than ever known, but the reserves have been so completely cleaned up as to cause anticipation of an ore famine before spring, and the prices of ore have advanced 50 per cent. In view of the anticipated shortage of ore, the question of shipments for next year is a serious one. On all the mining ranges of Lake Superior elaborate preparations are being made for next year's shipments. Especially is this true of the Mesaba. When the season of 1895 opened there were but 10 mines where owners had any intention of shipping ore during the year. The season closes with 21 active mines, and with from 8 to 12 more that will be prepared this winter for shipments in 1896. It is safe to say that the Mesaba's operations in 1896 will be confined only to the limit of capacity of docks and railroads. With 5,000 ft. of new ore dock frontage, for the three roads now engaged in Mesaba traffic, with from 800 to 1,200 additional ore cars and with important rail and track improvements, it is safe to say that the Mesaba roads can easily add 50 per cent. to the 4,000,000 gross tons they delivered to vessels in 1895.

Of all the great corporations engaged in the iron mining business in America, the Minnesota Iron Co. easily leads Up to last year the Metropolitan Iron and Land Co., owning the Norrie mine in the Gogebic range, had made the world's record for a single concern with shipments in 1892 of about 1,100,000 tons In 1894 the Minnesota, controlling mines on both Minnesota ranges, passed the other, and this year it will close the season with the enormous business of 1,900,000 tons. The mining of this quantity of ore, all from underground, its rail transportation to the lake, the carriage of nearly half of it to Lake Erie, and its handling on dock there is one of the greatest business enterprises in America. This company is now opening several large new mines for use in 1896; is pushing its present properties to a development they have never before attained, and is exploring with a view to purchase and development, a number of tracts of land which promise to be rich in ore.

With the ore consumption now probable for next year, and with the price likely to be received by ore men, the immediate future of the Lake Superior mines seems to be full of promise.

Storage Batteries on a Chicago Street Line.

The control of the Englewood & Chicago and Chicago & Morgan Park electric street railroads has passed into the hands of Eastern capitalists. Among these are J. C. Shaffer, August Belmont, President J. L. Waterbury, of the Manhattan Trust Co., of New York; President Griscom, of the International Navigation Co.; Isaac L. Rice, and President W. W. Gibbs, of the Electric Storage Battery Co., of Philadelphia, which controls all the important patents for storage batteries. The road when completed will have 54 miles of double track and 50 cars equipped with storage batteries in operation by next spring. One mile of the road is now built.

Railroads in Japan.

The Belgian Vice-Consul at Yokohama reports that railroad construction is about to be resumed. An appropriation has been made for the construction of a double track line from Tokio to Kobe, 376 miles.

Whaleback to Carry Locomotives to Russia.

The British whaleback steamer Turret Bell has been chartered to carry 20 locomotives building at the Baldwin Locomotive Works to Novorossisk, Russia, early in December. The locomotives are for use on the Russian Government roads. The Baldwin contract is for 40 locomotives altogether.

The Delaware River Bridge.

Only a few months ago the plans of the Pennsylvania Railroad for bridging the Delaware River, near Frankford, just north of Philadelphia, were being discussed, and now it is announced that the company hopes to have the first train cross the bridge on Jan. 1. It is quite certain that the bridge will be completed in time for summer traffic to the seashore resorts to which trains now run from Camden. The facilities for getting to Atlantic City and other resorts by an all-rail route from Broad Street Station will be greatly appreciated by many Philadelphians, but the chief beneficiaries will be the travelers from the distant cities, who can then go through to the coast without stopping. The bridge has been planned so that it shall be no bar to commerce and so that commerce in the river shall be no bar to its use by the railroad company. The approaches have been elevated at great expense, so as to avoid grade crossings, and when the new line has been opened the trains from Broad Street Station will have an unobstructed way to the several lines of road in New Jersey which now center in Camden.—*Philadelphia Public Ledger.*

English Notes.

Sir Henry Tyler has lately been at the Isthmus of Panama, on his way to Peru, and he thinks that the plans of the Panama Canal Co., as now modified, can be accomplished in five or six years at a cost of $100,000,000. He found several thousand men engaged on the work.

The South Eastern Railway, of England is building some passenger cars of "a very improved type." Those which are for third-class passengers have the seats and backs comfortably padded. All of the cars are to be lighted with gas Some of them, carried on bogies, have first, second and third class compartments. The company will try the "experiment" of heating one train by steam from the locomotive.

The Keeleys and the "Suckers."

It is said that John Jacob Astor has bought a controlling interest in the Keeley motor. As Mr. George Appo, the well-known green goods gentleman is said to have remarked, "a sucker is born every minute." We now suggest that Mr. Astor try the Keeley cure.

LOCOMOTIVE BUILDING.

The Pennsylvania railroad is fitting up at Altoona a locomotive with the Holden apparatus for burning liquid fuel. This apparatus was very carefully described with illustrations, in the *Railroad Gazette* of Feb. 26 1892. The Pennsylvania locomotive has not yet reached the stage of actual trial.

The Brooks Locomotive Works has begun to deliver to the Lake Shore & Michigan Southern the 10 new freight engines ordered in July last, being part of an order for 30 engines placed by the company at that time. These are 10-wheel engines, and have 17 in. × 24 in. cylinders and 56 in. drivers. They are duplicates of the engines formerly built by the Brooks Works for the Lake Shore road, except that the boilers are 2 in. larger in diameter. The driving wheels of the engines now being built have cast steel centers.

CAR BUILDING.

The Toronto, Hamilton & Buffalo is in the market for a number of passenger cars.

The New York, Chicago & St. Louis is reported to be in the market for a number of box and coal cars.

The Illinois Central has placed an order for 1,000 cars with the Haskell & Barker Car Co., of Michigan City, Ind.

The Northern Pacific road has put into service a number of grain cars 37 ft. long, and with a capacity for 70,000 lbs.

The Carlisle Manufacturing Company has received a contract for the construction of 200 freight cars at its works at Carlisle, Pa.

The Central of New Jersey has ordered 500 new cars, 250 of which are to be built by the Lehigh Valley Car Co , and 250 by Murray, Dougall & Co.

The Toledo & Ohio Central has placed an order with the Michigan-Peninsular Car Co. for 200 box cars. The Tower coupler was specified on these cars.

The Bangor & Aroostook has received six new cars for the passenger service from Jackson & Sharp, of Wilmington, Del. They consist of two passenger, one combination, one express, one baggage and one combination mail, express and baggage car.

The Toledo, Ann Arbor & North Michigan awarded its long talked of order for cars to the Pullman Car Co., last week. The contract includes 725 cars, all box cars, and the last 25 are to be large sized furniture cars. The livery is to begin on Jan. 1.

The Pennsylvania road has recently given out contracts for 1,000 cars in addition to the 2,000 ordered earlier in the year These cars are for the lines west of Pittsburgh and the order for building them was divided as follows: 400 to the Pullman Car Co., 300 to the Missouri Car & Foundry Co., and 300 to the Mt. Vernon Car Manufacturing Co.

BRIDGE BUILDING.

Albert Lea, Minn.—The Gillette-Herzog Manufacturing Co. has been awarded the contract for a 60-ft. steel bridge and a dam across the outlet of Fountain Lake. Their bid was $2,785.20.

Allegheny, Pa.—The contract for raising the grade of the Woods' Run viaduct on California avenue has been awarded to the Pittsburgh Bridge Co. at a contract price of $16,490.

Annapolis, Md.—The County Commissioners have approved the contract of the Groton Manufacturing Co., of Groton, N. Y., for constructing an iron bridge over Marley Creek for $1,025.

Baltimore, Md.—Mayor Latrobe has signed an ordinance to place a foot bridge over Gwynns Falls on Frederick Road.

Belfast, Me.—The city of Belfast proposes to construct a bridge across Belfast Harbor, and last week the United States Army Engineer in charge of the district gave a hearing on the application made by the city to the Secretary of War for authority to construct the structure. A number of people, owners of wharf property and representatives of the shipping interests objected to the erection of the bridge.

Boise City, Idaho.—Press reports say that proposals for reconstructing the bridge over the Boise River will be received until Nov. 16.

Cleveland, O.—City Engineer Rawson has prepared terminal plans for a proposed bridge across the Lake Shore tracks at Seneca, N. Y., near the Union station. These plans provide for a structure 16 ft. wide with two spans, 70 ft. and 90 ft. long, across the Lake Shore tracks. The total length of the bridge will be 610 ft. The approximate cost is over $9,000.

Press reports state that plans have been completed for a 500-ft. plate girder bridge, in six spans, over Walworth Run, at Rhodes avenue. The estimated cost of the bridge is from $80,000 to $90,000.

Duquesne, Pa.—In order to enable its workmen to pass to and from its big plant without danger the Carnegie Company proposes to erect a viaduct from the steel yards to Duquesne avenue. The improvement will cost about $10,000.

Lincoln, Neb.—An ordinance has been passed by the City Council for the issuing of $200,000 worth of bonds, for rebuilding the North Side viaduct.

Lowell, Mass.—Bids will be received until Nov. 14 for the iron work to be used in the bridge at Moody street. The contractor will be allowed until the middle of next April to finish the work.

Maple Hill, Ont.—The Township Council of Brant are considering the advisability of building a bridge over the Saugeen River at this place.

Middletown, O.—Proposals are wanted until Nov. 19 for an iron and steel hoist or swing bridge across the Miami & Erie Canal at Franklin road; also for building abutments for same. Address Frank X. Duerr, County Auditor, Hamilton, O.

Mumford, Robertson Co., Tex.—Press reports say that the contractors have just finished a bridge across the Brazos River near Mumford, costing $18,000. It has opened up a near transportation for the people on the eastern side of Milam and Burleson counties, and will be of great help to the Brazos Valley Railroad, as nearly all the cotton and seed that will be raised in that section will be brought to Mumford and shipped to Hearne.

New Brunswick (Canada).—Tenders are being asked for the construction of a bridge over the Gisiguit stream, in the parish of Wicklow. The plans and specifications may be seen at the office of Robert Squires, at Bath, N. B.

Ottawa, Ont.—The Board of Works have sent a petition to the City Council in favor of erecting a bridge across the canal opposite Somerset street, and a deputation will probably be appointed by the Council to interview the Government on the matter.

Pitcairn, Pa.—The Pennsylvania is erecting a new overhead bridge at Pitcairn, crossing the tracks connecting Patton with Versailles township. The bridge without approaches will be 900 ft. long.

Rochester, Pa.—The contract for the new suspension bridge across the Ohio River, connecting Rochester and Monaca, will be let this week. The plans have been prepared by E. K. Morse, and it will be built by a company composed of A. J. Jolly, Henry Cooper, A. M. Jolly, Samuel Moulds, Henry Camp, Cyrus Dannals and Henry Hoffman. It will have a channel span of 50 ft., will be 90 ft. high, and will cost $175,000.

Sorel, Que.—E. A. D. Morgan, on behalf of the South Shore Railway Co., last week applied to the Railway Committee of the Privy Council for approval of plans of a bridge over the Richelieu River at Sorel. A decision will be given this week.

Syracuse, N. Y.—Bids have been received for a stone arch bridge over Harbor Brook, at Park avenue. The bids included both cement and stone structures. The lowest, that of Fred L'Strange, was $3,393 for a stone arch.

Washington, D. C.—We are informed that a petition has been laid before the district commissioners by the Washington Market Co. to allow that company to build a bridge at Ninth street.

Wilkes-Barre, Pa.—The grand jury has approved the petitions for iron bridges over Solomon's Creek, in Hanover Township, at Buttonwood, to cost $1,500, and over Huntington Creek, in Huntington Township, to cost $800. Petitions for some 25 stone arch bridges, ranging in cost from $150 to $1,000, were also approved.

Williamsport, Pa.—The bids for constructing a new iron bridge across Muncy Creek at Picture Rocks were opened last week by the County Commissioners. There were eight proposals, ranging from $4,910 to $4,622, all of which were rejected by the board on account of the excessive price.

MEETINGS AND ANNOUNCEMENTS.

Central Railway Club.

The following is the programme for the meeting at the Hotel Iroquois, Buffalo, N. Y., on Friday, Nov. 8. Reports:

"When locomotive boiler tubes require to be safe-ended, should the safe-end be welded to the tube proper with a lap-weld or butt-weld, and in what respect is one method preferable to the other? What would be the comparative cost of these two methods?" Committee—J. H. Moore, Chairman; J. N. Weaver.

"What is the proper method of stenciling the right weight on freight equipment cars with a view of having the stenciled weight agree with the actual weight after the lumber in the cars has dried out?" Committee—J. Mackenzie, Chairman; A. C. Robson.

DISCUSSION.

Report of Committee on "Management of Steam Heat on Passenger Equipment; is the Use of a Trap Necessary or Advisable?"

Report of Committee on "Comparative Service Derived from Flues in Locomotive Boilers Working with a Steam Pressure of 125 to 140 lbs. when Boiler is Carrying 160 to 200 lbs."

"Proper Way to Bring Draw-bars to their Right Height, and the Form of Gage to Determine the Actual Height of Draw-bars on Cars in Service."

Topical questions submitted by members.

This is a new feature for which the regular order of business named in the new constitution and by-laws provides.

American Society of Civil Engineers.

At the meeting of Oct. 2, 1895, the Secretary announced that the following appointments for the current year had been made by the Board of Direction, and that all the gentlemen named had accepted:

The Board of Censors to award the Norman Medal: Messrs. Robert Moore, Charles Walker Raymond and Palmer C. Ricketts.

The Committee to award the Rowland Prize: Messrs. Charles L. Strobel, William Rotch and the Secretary.

E. C. Moore, Jun. Am. Soc. C. E., presented a paper on "Moving Two 36-in. Water Mains Without Shutting Off the Water," and it was discussed by Messrs. H. W. Brinckerhoff, Wegmann, Platt, Owen and the author.

Howard Constable, M. Am. Soc. C. E., presented a number of photographs of the Ireland Building in New York City, which fell during construction, and an informal discussion of this disaster and of the New York building laws followed.

October 16—A paper by Thomas C. Clarke, M. Am. Soc. C. E., entitled "Effect of Depth on Artificial Water-Ways," was read by the Secretary in the absence of the author, as were also written discussions by Messrs. W. J. Babcock, L. J. Le Conte, L. C. Sabin, Thomas T. Johnston and Richard Lamb. The paper was discussed further by Mr. E. P. North, who presented several specially prepared diagrams relating to the subject, and by Mr. Chauncey N. Dutton.

The Secretary announced that a plot (50 ft. front, 110 ft. deep) had been purchased for the new Society House, on the south side of Fifty-seventh street, between Broadway and Seventh avenue.

Wednesday, Nov. 6, the paper was "The Discharge of the Mississippi River," by William Starling, M. Am. Soc. C. E. An abstract has been published in the *Railroad Gazette*.

On the evening of Wednesday, Nov. 20, 1895, a paper by Robert Brewster Stanton, M. Am. Soc. C. E., entitled "Notes on the Construction of a Water System for Placer Mining, and Suggestions for a New Method of Dam Building" will be read. An abstract follows.

A WATER SYSTEM FOR PLACER MINING AND SUGGESTIONS FOR A NEW METHOD OF DAM BUILDING.

In the spring of 1893 the author began the construction of a pipe line and reservoirs for the development of a placer mine, comprising 14 claims on the summit of the Coast Range in Southern California. The water supply was obtained about 2.5 miles from the mine, at a place where there is a basin from 1,200 to 1,500 acres in area, bounded on three sides by abrupt mountain slopes. The snow drifts and packs into this basin during the winter, and remains until late in July. Springs issue at the lower edge of the basin, at the head of San Antonio Creek, and form the source of the water supply for the mines. The water from these springs drops into the gulch at the head of this stream, and sinks into the debris that fills the gorge. To catch this water and turn it into the head of the pipe line, a small reservoir was built.

The debris was leveled off across the gulch for a width of 60 ft., leaving a bottom of finely broken granite rock, with the rock walls of the hill on three sides. A pine log dam 6 ft. high was built across the gulch, and lined with a double thickness of plank sunk into a trench in the debris, the fine rock fragments being filled back against the plank. Owing to the fact that the gravel in the mine was of limited extent, all the work done on this reservoir and other parts of the water system was of a temporary nature. There were five different materials in this small basin to be joined by a water-tight lining; shattered slate to be joined to solid granite and to the plank dam; the broken stone bottom to be joined to slate, granite and planking; and the planking to be joined to the end of the iron pipe line. This was done by covering the whole inner surface with two coats of hot asphalt paste, which was not over 0.5 in. thick after the crevices were filled. The paste was made of four parts of the best refined California asphaltum and one part of crude patroleum, without sand. These were boiled together until, when absolutely cold, it was brittle under the hammer, while elastic and pliable with the least warmth. This lining is in good condition after two summers and a severe winter, the only repairs made being the application of a few quarts of asphalt last spring.

The pipe line is just two miles long from the collecting reservoir to the pressure reservoir, and runs along a very steep, rough and sinuous mountain side, where it would be impracticable to maintain a ditch or flume on account of the snow and rock slides from the mountains. The pipe was made of No. 16-gage sheet iron; it was boiled in asphalt and had driven joints. The first 1,800 ft. is 12 in. in diameter, then comes 2,000 ft. of 10 in., and the remainder is 8 in. The first 500 ft. is on a grade of 40 ft. per mile, the last 1,500 ft. has a grade of 26.4 ft. per mile, and the remainder 16 ft. per mile. Air valves are located about 1,200 ft. apart along the whole line, and cross and waste valves are provided at the upper and lower ends, and at the head of the 8-in. section. It was decided to be cheaper to lay the pipe on these continuous grades than to cross the gulches by descending into them, and the pipe line could be emptied of water in winter without the use of so many expensive valves. The size of the pipe line was not so large as recommended by the author, but was determined upon to save the extra first cost of larger sections. At three places the line is carried over gulches by wooden lattice spans, the timber for which had to be carried up the mountain on men's backs, like all the pipes, valves, asphaltum and other materials. The laying of the pipe was very difficult where an immense rock slide had to be crossed. Here the loose top material would move with jarring, and only one 20-ft. length of pipe could be laid at a time, as a longer trench could not be kept open. It was dangerous work, for in driving the joints the heavy blows of the maul shook the whole slide.

The pressure reservoir was built for two purposes: *first*, as a penstock at the head of the pressure pipe leading to the mines; *second*, as a reservoir to hold water for some hours during latter part of the season when the supply is limited. It has a capacity of 330,000 gals., but, as originally designed, it was to hold 3,000,000 gals. The depth at the bottom portion is 12.5 ft. It is located at the head of a gulch on a thickly timbered part of a ridge above the mines. A semicircular dam was built across the gulch, of a single thickness of large pine logs with ends sawed on radial lines and butted close together, forming an arch with a slight batter up stream. Each row of logs is separated with and bound together by smaller logs laid at right angles to the dam and extending up into the reservoir. As these were put in place a bank was formed on the upper side of the timber of earth and broken rock well tamped around the logs. The slope on the upper side of this filling is 1½ to 1.

There is no material in the neighborhood that could be used in any way as puddle for a dam, and the bottom and sides of the reservoir are of earth, rotten granite and shattered slate. To make the basin water-tight, a lining was formed of asphalt concrete. This is not what is known in the street-paving business by that name, which is composed of asphaltum and sand, for clean, sharp sand would have cost $20 a ton delivered on the mountain, but is a true concrete of broken stone and asphaltum. The stone was obtained from a near-by porphyry dyke, and was broken into pieces 2 in. or less in size. All the fine material was left and enough more added to have the entire mass free from all but the smallest voids. This concrete was prepared in two street paving pans. The rock was heated and well mixed in one pan, and the mixture of four parts of refined California asphaltum and one part of crude petroleum was boiled in the other. The boiling paste was poured with ladles over the hot rock and the whole mixed over the fire until every particle of stone, sand and dust was thoroughly covered with the paste. The concrete was then taken in hot iron wheelbarrows to the site of the work and put in place in the usual manner, being rammed, rolled and smoothed down with hot irons. It was put on in a 4-in. layer, in strips from 4 to 6 ft. wide, and where the strips were joined, the old edge was well coated with hot paste. After the lining was finished it was painted with hot paste mixed in the same proportions, but boiled a much longer time, until, when entirely cold, it was hard and brittle, breaking under the hammer like glass, yet tough, pliable and elastic when warm. This coat was applied while the paste was very hot, and should not be over ⅛ in. thick, although through the fault of the contractor it exceeded this amount at some places in the reservoir mentioned The lining cost 15 cents a square foot.

In spite of the faulty manner in which the material was laid in places by the contractor, it has stood so well that the author has advised its use on a rock-fill dam, 120 ft. high, to be built in Southern California. After clearing the site of the dam to bed-rock, and preparing proper toe catches in the bottom of the canon where the structure is to be located, a gravity dam is to be built of loose rock blasted from the sides and dumped in place by cableways. Care must be taken to have the larger masses of stone surrounded with smaller pieces so as to reduce the amount of settling and movement to a minimum. The inner face of this dam is to be laid up with great care. A thickness of perhaps 10 or 15 ft. at the bottom diminishing to from 2 to 5 ft. at the extreme top should be placed by hand in the form of a well laid dry wall. The joints should be well filled with small stones and the surface left as even as can be done without hammer dressing, though not smooth. Starting from the bottom, every 5 or 6 ft. of this hand-placed surface should be stepped back about 3 in., leaving a series of these narrow bermes all the way to the top. On the surface thus prepared, place a true asphalt concrete, perhaps 1 ft. thick; if this is properly proportioned, mixed and laid, the 3-in. steps will prevent creeping.

PERSONAL.

—Mr. George P. Johnson, of Frederick, Md., has been appointed Superintendent of Car Service of the Seaboard Air Line, with headquarters at Portsmouth, Va.

—Mr. John Higginson, Master Car Builder of the Canadian Pacific, has resigned that office, taking effect from Nov. 1. For the present Mr. Higginson will continue to reside in Montreal.

—Mr. F. B. Smith, Master Mechanic of the New York, Pennsylvania & Ohio road at Meadville, Pa., has resigned to accept a position as General Master Mechanic of the New York, New Haven & Hartford.

—Mr. Robert M. Shank, General Passenger Agent of the Altoona, Clearfield & Northern, died at his home at Altoona, Pa., Nov. 2, after a week's illness Last spring he left the service of the Pennsylvania at Altoona to take the post he held at the time of his death.

—Mr. Albert Griggs, formerly Superintendent of Motive Power of the New York & New England, and

more recently Assistant Superintendent of Motive Power and Machinery of the Chicago & Eastern Illinois, has resigned, and the office of Assistant Superintendent of Motive Power has been abolished.

—Mr. J. W. Dalbey, of the Kansas City Northwestern road, has been appointed Division Superintendent of the Union Pacific, Denver & Gulf and the Denver, Leadville & Gunnison, in place of M. F. Egan, who has been assigned to other duties, becoming master mechanic of both roads in place of J. P. Bay, who has resigned.

—Mr. F. C. Prest has been appointed Purchasing Agent for that p rtion of the Northern Pacific included in the jurisdiction of receivers McHenry and Bigelow; that is, fro n Ashland and St. Paul to the Montana state line. This is a new position, being created to relieve Assistant Ge eral Manager W. G. Pearce who here tofore also had the title of General Purchasing Agent. That position is now abolished.

—Mr. L J. Seargeant, formerly General Manager of the Grand Trunk, was elected a member of the Board of Directors at the recent half yearly meeting of the stockholders in London. Mr. Seargeant will probably make his headquarters in London, at least for the greater part of each year. Mr. Hays, the new General Manager of the Grand Trunk, does not assume the duties of that office until about Jan. 1, and of course Mr. Seargeant will continue to act as General Manager until relieved by Mr. Hays.

—Mr. John Taylor, General Traffic Manager of the Lehigh Valley road, died of paralysis on Nov. 2, at Bethlehem, Pa., aged 64 years. Two years ago he suffered the first stroke, but after a trip of several months abroad he recovered. Three weeks ago he was again prostrated. Mr. Taylor was a rodman on the Lehigh Valley while it was being built, and when the road was opened he became Station and Freight Agent at Mauch Chunk. Subsequently he was promoted to the office of General Freight Agent, and 15 years ago was elected General Traffic Manager.

—Mr. J. M. Barr, General Superintendent of the Western district of the Great Northern, has also been appointed to the same office on the Eastern district, which becomes vacant by the resignation of Mr. E. W. McKenna. Mr. Barr, therefore, has jurisdiction as General Superintendent over the entire transcontinental line of the Great Northern. He became General Superintendent of the Eastern district of the Great Northern about a year ago, prior to which time he was for several months Superintendent of the Breckinridge division of the Great Northern. Like Mr. McKenna he came to the Great Northern from the Chicago, Milwaukee & St. Paul, of which he was Superintendent of the Chicago division.

ELECTIONS AND APPOINTMENTS.

Akron Transfer.—The annual meeting of the company was held at Akron, O., on Nov. 4. The following officers were elected: D. P. Reighard, Pittsburgh, President; D. E. Hill, Akron, Vice-President; E. F. Huston, Pittsburgh, Secretary and Treasurer. These gentlemen and G. A. Gullen and C. S. Cobbs, of Akron, comprise the directors.

Alabama Great Southern.—The following appointments are announced effective from Nov. 1: W. H. Green, General Superintendent, 1300 Pennsylvania avenue, Washington, D. C.; W. A. Vaughan, Assistant-General Superintendent, office at Chattanooga, Tenn., as heretofore.; C. H. Hudson, Chief Engineer, Washington, D. C., and R. D. Wade, Superintendent of Motive Power, Washington, D. C. With these appointments President Spencer has extended the jurisdiction of all the general officers of the Southern Railway over the above road.

Atlantic, Suwanee River & Gulf.—F. H. Elmore has been appointed Auitor, vice H. H. McDonald.

Central Massachusetts.—G. F. Seymoure, for 17 years Clerk and Treasurer of the road, declined re-election at the annual meeting, and Henry Hornblower, of Hornblower & Weeks, of Boston, was elected in his place.

Chester & Lenoir.—The office of General Freight and Passenger Agent has been abolished and the business in that department will hereafter be attended to by the President.

Chicago, Peoria & St. Louis.—T. D. Hinchcliffe, Auditor and Treasurer, having resigned to accept service with another company, W. D. Tucker has been appointed Auditor and G. A. Hackett Treasurer.

Cleveland, Akron & Columbus.—George L. Bradbury, Vice-President, with office at Cleveland, O., announces the following changes since the Lake Erie & Western began operating the road: H. C. Parker has been appointed General Traffic Manager, with office at Indianapolis; J. J. Sullivan has been elected Treasurer, with office at Cleveland; Squire, Sanders & Dempsey have been elected counsel for this company, with office in Perry-Pane Building, Cleveland, O., vice J. H. Hoyt, previously counsel, and H. T. Mathers, formerly general attorney, resigned.

Cleveland, Cincinnati, Chicago & St. Louis.—The annual meeting of the stockholders was held at Cincinnati, Oct. 30. Three directors were re-elected: Alex. McDonald, Cincinnati; James Barnett, Cleveland, and George A. Farlow, Boston. They serve to Oct. 1898.

Duluth, Mississippi River & Northern.—The title of J. F. Killorin has been changed from General Superintendent to General Manager, that of G. M. Stark from General Attorney to General Counsel, that of H. O. Halstead from General Passenger and Freight Agent to Superintendent.

Flint & Pere Marquette.—C. S. McMillan has been appointed Acting Auditor, vice Gilbert W. Ledlie, deceased.

Great Northern.—J. M. Barr has been appointed General Superintendent of the Eastern District, vice E. W. McKenna, resigned. Mr. Barr will continue in charge of the Western District until further notice.

Manitou & Pike's Peak.—The directors elected for the ensuing year are R. B. Cable, H. S. Cable, E. T. Jeffery, Z. C. Simmons and J. B. Glasser.

Michigan Central.—At a meeting of the Board of Directors held Oct. 23, the office of cashier was abolished, and the office of local treasurer created in its place. John E. Griffiths, who has occupied the office of cashier for a number of years, has been appointed to the new position of Local Treasurer, with office at Detroit as heretofore.

Missouri, Kansas & Texas (of Texas).—J. W. Allen, General Freight Agent, with headquarters at Dallas, Tex., has resigned on account of ill-health, and W. B. Groseclose, Commercial Agent of the road at Houston, has been appointed his successor.

Monterey & Mexican Gulf.—This road is now being operated by representatives of the Belgian interests in the property, as already announced. The following is a list of the new officials, some of these appointments having also been previously announced: August Frezes, President, with office at Brussels, Belgium; Joseph Kling, Secretary with office at New York; A. Monom, General Manager; Wm. Mackenzie, Chief of Traffic and Transportation Departments; H. Nollau, Chief of Locomotive and Maintenance of Way Departments; Jos. Boulton, Auditor; E. Des Essarts, Purchasing Agent; J. M. Trevino, Car Accountant; R. H. Vaughan, Traffic Agent, No. 29 Broadway, New York; and W. H. Auld, European Traffic Agent, with office at No. 22 Water street, Liverpool, Eng. The general offices are at Monterey, Mex.

Nittany Valley.—Mortimer C. Donoghue has been elected General Superintendent.

Ohio Southern.—The appointment of A. S. Dunham as General Manager, with office at Springfield, O., was reported some weeks ago. Other changes are announced as follows: W. K. Kearsley, Assistant Auditor, with office at Lima, O. C. H. Roser, previously Superintendent, has been appointed Purchasing Agent, with office at Springfield, O. L. Rush Brockenbrough has been appointed General Freight and Passenger Agent, with office at Springfield, O., vice J. F. Youse, previously General Freight Agent, and F. E. Fisher, previously General Passenger Agent. B. W. Fenton is Chief Engineer, with office at Lima, O. W. H. Yeazell is Car Accountant, with office at Springfield, O.

Oregon Improvement Co.—B. F. Bush has been appointed General Superintendent, with office at Seattle, Wash.

Pennsylvania.—W. H. Porter, for several years Assistant Supervisor of the West Penn division, with headquarters in Allegheny, has been promoted to be Assistant Supervisor of the New York division, with headquarters at Jersey City.

Luther Z. Zollinger, of Harrisburg, formerly of the Pittsburgh division, has been promoted to be Assistant Supervisor of the Spruce Creek sub-divison, to succeed Ashville Welsh, who was appointed General Manager of the Philadelphia belt line. Previous to his promotion Mr. Zollinger was assistant to Engineer Hutchinson, of the Philadelphia division.

Philadelphia, Reading & New England.—W. W. Caldwell has been appointed Car Accountant, vice J. R. Doran.

Philadelphia, West Chester & Lancaster.—The directors of this new Pennsylvania company are: Chas. T. Shields and Chas. O. Beaumont, of Philadelphia; Mercer E. Gibson, Sharon Hill, Pa.; Wm. S. Kirk, Henry B. Buckwalter and Robert T. Cornwell, West Chester, Pa.; Galen Le Feure, Quarryville, Pa.; S. Wesley Smith, Cochranville, Pa.; John P. Wilkinson, Unionville, Va., and Winslow Mason, of Philadelphia, President.

Plant System.—J. Moultrie Lee has been elected Treasurer and R. B. Smith Secretary of the Sanford & St. Petersburg road.

Seaboard Air Line.—The company abolished the office of Car Accountant on the 1st instant, thus relieving W. P. McGeeher, of Raleigh, N. C., from duty, and created the office of Superintendent of Car Service, to which position George P. Johnston has been appointed, with office at Portsmouth, Va.

Southern.—The company has issued a circular of the organization of the freight department to go into effect Nov. 1. The line is divided into nine traffic divisions. Horace F. Smith is General Freight Agent, Washington, D. C. There are three Assistant General Freight Agents, James H. Drake, with office Richmond, Va.; Haiden Miller, Atlanta, Ga., and Edwin Fitzgerald, Louisville, Ky. The six Division Freight Agents are J. B. Munson, Raleigh, N. C.; A. G. Craig, Charlotte, N. C.; D. Cardwell, Columbia, S. C.; J. Gothard, Knoxville, Tenn.; L. Green, Birmingham, Ala.; Ray Knight, Selma, Ala. The office of Division Freight Agent at Atlanta, Ga.; and at Louisville, Ky., has been abolished; J. J. Griffin, General Agent, Jacksonville, Fla.; Henry S. Jackson, General Agent, Chattanooga, Tenn.; J. Edmunds Mason Soliciting Agent, Danville, Va., have been transferred to Washington, D. C.

St. Louis & San Francisco.—An election of Directors was held in St. Louis, Oct. 29, with the following result: Edward King, James T. Woodward, C. C. Rawlings, W. Emlen Roosevelt, John V. B. Thayer, John J. McCook and C. D. Wood, of New York; W. B. Wesley, of Rye, N. Y.; B. P. Cheney, Jr., of Boston; B. L. Merrill, J. E. McKeighan and Richard C. Kerens, of St. Louis; and Aldace F. Walker, of Chicago.

Texas Central.—W. F. McMillin has been appointed Acting General Freight and Passenger Agent, with headquarters at Waco, Tex.

Union Pacific, Denver & Gulf.—B. L. Olds having resigned, the office of Purchasing Agent has been abolished. All requisitions for material should be sent to, and purchases will be made by, the General Superintendent until further notice. Correspondence pertaining to accounts of purchasing department should hereafter be addressed to A. D. Parker, Auditor, Denver, Col.

RAILROAD CONSTRUCTION,
Incorporations, Surveys, Etc.

Aberdeen & West End.—President A. F. Page states that the new line of this road to Troy, N. C., which has been in course of construction for several months, will be completed, probably, during the present month of November and ready for operation by Dec. 1 next.

Akron Transfer.—President D. P. Reighard, of Pittsburgh, stated at the annual meeting this week that the road is to be extended from Akron to connect with the Cleveland, Canton & Southern at Mogadore, O., immediately.

Canon City & Cripple Creek Gold Belt.—This company was incorporated in Denver recently by T. S. Wells, J. H. Peabody, B. E. Rockafellew, F. A. Raynolds and E. L. Bartlett, of Canon City, Colo., for the purpose of securing some of the trade of the Cripple Creek district. The route will be about 30 miles long.

Edmonton District.—This company gives notice of application to the Dominion Parliament for a charter with power to construct a line of railway from Edmonton, Northwest Territories, to a point on the Athabaska River, near Fort Assiniboine, with a branch to Stony Plains.

Florence & Cripple Creek.—The company is making a reconnoissance for a new line in Eight Mile Canon, to carry the roadbed above any possible high flood mark.

Florence Southern.—The engineers who have been engaged for the past three months upon the final survey for the road have practically completed their work, and are engaged in securing the best route out of Florence. The total length of this line from the Florence to Silver Cliff will be 35⅞ miles. For the first 12 miles out of Florence the grade will not exceed 2½ per cent., and the maximum curvature will be 16 deg.; the next seven miles is through Oak Creek cañon, and the grade will not exceed three per cent. and curvature 22 deg., while the remainlng 16 miles will have a one per cent. grade, and 16 deg. curvature. The first ten miles out of Florence runs over a coal bed, and the last 16 miles at the Silver Cliff end of the line runs through a rich portion of the Custer county mineral belt.

Glendon & Gulf.—Ten miles of this road is now in operation southwest of the town of Gulf, in the southern part of Chatham County, N. C. The General Manager states that about six miles of additional read will be built during the coming winter. The grading will probably be done by convict labor, if an arrangement can be made to use that class of labor.

Hamilton, Brantford & Pacific Junction.—At the next session of the Dominion Parliament application will be made for a charter for this company. The proposal is to build a line from a point on the Toronto, Hamilton & Buffalo, near Copetown, to connect with the Canadian Pacific at Schaw Station, Ont.

Hendersonville & Brevard.—This railroad has been formally opened for regular freight and passenger traffic for its entire length of 21 miles, from Hendersonville, to Brevard, N. C. The line is located in the western part of North Carolina, in the mountainous district of the Transylvania County. Hendersonville is south of Asheville, on the Southern Railway. The construction of the road was undertaken early this year by Warren, Jenks & McNeely, of New York City, and has been carried on continuously. The cost of construction is said to have been about $347,000. A. E. Broadman, of Brevard, is President of the company, and W. A. Smith, of Hendersonville, N. C., is General Agent in charge of the operation of the line.

Indiana Midland.—Articles of incorporation of this company were filed w th the Secretary of State at Indianapolis last week. The road is to be 160 miles long, to be built from a point on the Wabash River, 10 miles south of Terre Haute, across the State to a point on the Ohio State li e. The capital stock is $160,000. The stock is nearly all taken by E. C. Rice, of St. Louis.

Midland Terminal.—The night passenger train from Denver to Cripple Creek now goes to Anaconda station, two miles from the terminus in Cripple Creek. With the completion of the line the company will purchase its own rolling stock, its present service being with cars and locomotives rented from connecting lines.

Missouri, Kansas & Texas.—The new line east of Holden, Mo., generally called the Kansas City extension, was opened for regular freight traffic on Nov. 1. Regular passenger trains will probably not begin running until late in the month. This new line is about 18 miles long and extends to Sedalia. A direct line from that town connects with the St. Louis line, built as the Missouri, Kansas & Eastern, connecting with it just below Franklin, on the Missouri River. The construction of the Holden branch gives the company a direct line of its own between St. Louis and Kansas City. At Holden connection is made with the old Kansas City & Paola, extending from Holden to Paola just south of Kansas City. For a number of years this branch was operated by the Missouri Pacific, being taken over this year by the Missouri, Kansas & Texas.

New Brunswick Roads.—L. M. Buck has just completed the survey of the proposed line of railroad from Newcastle Bridge to the mouth of the Nashwoak River, opposite Fredericton, a distance of 30 miles. A fairly easy route has been obtained. In several places, however, a re-examination of the ground will be necessary to reduce the amount of excavation and filling. The bridge work will be light.

Patten & Sherman.—President A. A. Burleigh was re-elected at the annual meeting last week. At that meeting it was reported that the work of construction would be pushed as rapidly as possible to complete the grading this season. About 100 men are now at work on the road. It is expected that by Nov. 15 the grading of three miles of the road will be nearly completed and the remaining three miles well under way. The line is to reach the town of Sherman, north of the main line of the Bangor & Aroostook. It will be operated by the latter company when completed.

Philadelphia, West Chester & Lancaster.—This company was incorporated in Pennsylvania this week to build a road from the City of Philadelphia to the City of Lancaster, Pa., by way of Doe Run, Unionville, Cochranville, Quarryville and West Chester and branches, the length of such a road being about 80 miles. Winslow Mason, Philadelphia, is President.

Pittsburg & Lake Erie.—Rapid progress is being made on the extension of the McKeesport and Bellevernon branch. The grading and trestle work is all completed and ready for the ties. The rails may be laid in time to have passenger trains put on in November. A number of coal firms have already arranged to ship coal over the line, and will build tipples.

Queen Anne's.—Civil engineers are completing surveys for this new line from Queenstown, Md., to Lewes, which is now being constructed, the grading and track laying being well under way. The road will form a route 90 miles long from Baltimore to the ocean. The distance from Baltimore across the bay to Queenstown being 30 miles, and from Queenstown to Lewes, Del., 60 miles.

Sanford & Lillington.—Much of the capital stock for the construction of this road, from Lillington to Sanford, N. C., a distance of 25 miles, having been subscribed, preliminary work has begun. J. D. Boushall, of Raleigh, the attorney having the matter in charge, says that over one-half the capital necessary to construct the line has been raised, and that the other will be forthcoming at the proper time. Lillington is an inland town in Harnett County, without railroad facilities, and this road will open an important and rich country, connecting at Sanford with the Raleigh & Augusta road, part of the Seaboard Air Line's main line.

Southern Pacific.—The extension of the Midland Branch in Louisiana has been completed and trains

began running over this 11 miles of new road last week. The new line extends the Midland Branch of the Louisiana Western south of Crowley, La., to the new town of Gueydan. There are three new stations on the line, which extends through the rice-growing district of the state. The object in building the line was to reach the property of the Vermilion Canal Co., which is building important irrigating works through the rice-growing lands. The only important work on the line was the construction of a 1,200 ft. trestle bridge over a bayou. With this new extension the Midland Branch is now 35 miles long from Eunice, its northern terminus, to Gueydan, crossing the main line at Midland Junction. Heretofore the branch line trains have been operated from Crowley, a station on the main line about six miles east of Midland Junction. Hereafter branch line trains will not run on the main line, being operated only between terminal points of the branch, connecting with main line trains at Midland Junction.

Steam Lumber Co.—This company will build a logging road on the Odanah Indian reservation in northwest Wisconsin to haul next year from 20,000,000 to 30,000,000 ft. and more subsequently.

St. Gabriel & Ste. Emelie.—Mr. R. Rinfret, C. E., of Montreal, has just located a road from St. Gabriel de Brandon, in the County of Bertier, to Ste. Emile, in the County of Joliette, Que., a distance of 15 miles. The work is to be begun next spring. The promoter of the project is Ald. C. Beausoleil, of Montreal.

St. Lawrence & Adirondack.—This company is pushing on its proposed new line near Valleyfield, Quebec, through Beauharnois and Chateauguay districts to Montreal. The company's engineer, Mr. Leonard, has opened an office at Beauharnois, and is personally conducting the survey. The line connects with the Canadian Pacific south of Montreal.

Washington County.—Loring Thompson, of St. Stephen, N. B., has secured a contract to build a section of this road, and has removed to Machias, Me., to commence operations. This is a sub-contract under James Mitchell and George Westcott, of Portland, Me.

GENERAL RAILROAD NEWS.

Ann Arbor.—In pursuance to the decrees of the United States Courts, the property of the Toledo, Ann Arbor & North Michigan Railway Company was transferred to the Ann Arbor Railroad Company on Nov. 1. Mr. W. R. Burt, Receiver of the old company, is President of the new corporation.

Ashland Lumber Co.—A press dispatch from Ashland, Wis., last week, announced a consolidation of the important logging railroads of the Ashland Lumber Co., and W. F. Pleas, which will hereafter be operated under one management, giving a direct route by rail from Chequamagon Bay to Siskiwitt Bay, on Lake Superior, and saving heavy towing charges.

Bangor & Aroostook.—A corrected statement of the operations for the year to June 30 shows that gross earnings from operations were $582,832; operating expenses and taxes were $383,200; leaving net earnings of $199,632; rentals and interest on debt were $180,438; the surplus for the year thus being $19,193. At the end of the fiscal year the company had in operation 263 miles of road

Beech Creek.—The annual report of the company for the year ending June 30 shows the following comparison of earnings:

	1895.	1894.	Inc. or dec.
Gross earn	$1,273,724	$1,125,533	I. $158,191
Oper. exp	694,791	795,726	D. 100,935
Net earn	$578,933	$329,807	I. $249,126
Fixed charges	327,999	332,972	D. 4,973
Profit	$250,934	Def. $3,165	I. $254,099
Dividend	220,000	220,000	.....
Surp'us	$30,934	Def $223,165	I. $254,099

The general balance sheet shows a profit and loss surplus of $191,736.

Cape Fear & Yadkin.—The Reorganization Committee has prepared a report to be submitted to the bondholders, which states that a reorganization of the road is possible only as a unit, and that such reorganization is absolutely essential to preserve the property and protect the interests of all creditors. Of the total issue of $3,054,000 of first mortgage bonds, $2,656,000 have been deposited with the Mercantile Trust & Deposit Co., of Baltimore, and the Farmers' Loan & Trust Co., of New York. The reorganization plan provides for the issuance of $500,000 of 4½ per cent. preference bonds, $3,400,000 of new general mortgage bonds bearing interest for four years at 3 per cent. and at 4 per cent. thereafter, $1,700,000 first preferred stock, $600,000 of second preferred stock, and $900,000 of common stock.

Central of Georgia.—The properties of the Central Railroad & Banking Co. of Georgia, in accordance with the order of court, were turned over to the new company, Central of Georgia Railway Company, on Oct. 31. All of the old officers in the operating and traffic departments have been retained by the new company.

Central Washington.—The lease of the road to the Northern Pacific was renewed last week. The Northern Pacific is to supply the Central Washington with rolling stock at an agreed price. This lease has been approved by Judge Hanford of the United States Court at Seattle. The former lease to the Northern Pacific Judge Hanford considered burdensome to the Central Washington. The road was built a few years ago through the Big Bend wheat district in Eastern Washington, and has been operated by the Northern Pacific since it was opened.

Columbus, Sandusky & Hocking Valley.—The sale of the road was affirmed by Judge Smalley at Bucyrus, O., Nov. 1., and the reorganization of the company will be accomplished without further delay. Some objection was made to the confirmation of the sale. The purchase was made by the bondholders' committee.

Kentucky Midland.—The property will again be offered for sale under foreclosure, at Frankfort, Ky., Dec. 2. The upset price is $320,000. At the former sale in September there were no bidders. The road is 40 miles long from Frankfort southeast to Paris, Ky.

Lockport & Buffalo.—The Town Council of Lockport, N. Y., has voted to accept the proposition made by the Reorganization Committee for the purchase of the stock owned by the city. This amounts to 1,000 shares more than the majority, and the cities receive par value. This road extends from Lockport to Tonawanda, north of Buffalo, and has been operated by the Erie since it was built. The Reorganization Committee in its investigation of the Erie accounts found that the operation of the road had resulted in an annual loss to the lessee for the last 10 years. It offered to purchase the property, taking the outstanding stock of $129,300 as par and assuming the bonded indebtedness of about $240,000 additional.

Louisville & Nashville.—The operations of the road for September and the quarter make this comparison with last year:

September:	1895.	1894.	Inc. or dec.
Gross earn	$1,693,934	$1,688,690	I. $5,244
Oper. exp	1,138,054	1,014,569	I. 123,485
Net earn	$555,880	$674,121	D. $118,241
Since July 1:			
Gross earn	$5,104,036	$4,810,260	I. $293,776
Oper. exp	3,379,639	2,969,675	I. 409,964
Net earn	$1,724,397	$1,840,585	D. $116,188

Macon & Birmingham.—A temporary order has been granted postponing the sale of the Macon & Birmingham and the Macon Construction Company properties for 60 days The order was granted on the application of the bondholders, who ask that the sales be postponed six months. The sale of the Construction Company's property was to have taken place last week and that of the Macon & Birmingham on Nov. 5.

Macon & Northern.—The stockholders transferred the property of this company to the new Central of Georgia Company last week, and formal possession was taken by the Central of Georgia officers on Nov. 1. This road is about 100 miles long, extending from Macon, Ga., north to Athens. It was built in 1888 and was leased in 1891 by the Central of Georgia and the Richmond & Danville. For a time the security holders refused to accept the terms offered them in the Thomas and Ryan plan for the reorganization of the Central of Georgia, and there were some negotiations for the lease of the road to the Seaboard Air Line. These fell through and later the security holders accepted the Reorganization Committee's proposition which had been slightly modified.

New York Central & Hudson River.—The earnings for the Sept. 30 quarter compare with previous years as follows:

	1895.	1894.	1893.	1892.
Gross earn	$11,600,505	$10,840,821	$12,211,847	$12,066,596
Oper. exp	7,745,524	7,114,758	8,268,089	8,398,521
Net earn	$3,854,981	$3,726,063	$3,943,758	$3,668,075
Fixed charges	2,630,549	2,630,152	2,629,884	2,508,220
Balance	$1,224,431	$1,095,911	$1,313,910	$1,159,855
Dividend	1,000,000	1,192,853	1,117,852	1,117,854
Surplus	$224,431 (def.)	$96,942 (sur.)	$196,057 (sur.)	$42,001
P. c. oper. exp.	66.7	65.63	67.71	69 63

Northern Pacific.—Judge Lacombe, in the United States Circuit Court at New York, has granted the application of Johnstone Livingston and others, second-mortgage bondholders, and C. B. Van Nostrand and others, third-mortgage bondholders, to be made parties to the suit of the Farmers' Loan & Trust Co. against the company for the removal of Thomas F. Oakes, Henry C. Payne and Henry C. Rouse, Receivers of the road, appointed Aug. 15, 1893, and for the appointment of new receivers. Similar action had been previously taken by the Judge of the Seventh Circuit. Judge Lacombe, in granting the application, said: "The trust company is trustee, under different mortgages, of the same railroad or of parts thereof. These several mortgages are necessarily conflicting, and it is manifestly impossible for the Trustee to fairly represent both sides in the resulting controversies, except by assuming such a position of neutrality as would seriously affect the force with which such conflicting interests are to be presented for the consideration of the Court. Under such circumstances it would seem appropriate to substitute new trustees, under all the conflicting mortgages but one. This, however, has not been done in the circuits where the property lies, and will not, therefore, be done here, the admission of representatives of these bondholders being probably sufficient to accomplish the object desired.

The receivers report the results of the operations of the main line for June, as compared with the figures of the system, including branches, last year, as follows:

	1895.	1894.	Inc or dec.
Gross earn	$1,271,358	$1,147,532	I. $126,826
Oper. exp.	921,378	1,097.085	D. 175.706
Net earn	$352,979	$50,447	I. $302,532
Other income	347,384	90,575	I. 256,810
Total income	$700,364	$141,022	I. $559,342
Charges paid	534,253	682,915	D. 158,642
Surplus	$176,111	Df $541,893	I. 717,984
Charges accr'd	433,122	421,979	I. 11,123
Deficit	$257,011	$963,872	D. $706.861

The "charges accrued" are interest on the second mortgage bonds and other junior obligations.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The company is to retain control of the Eggleston avenue right of way, described in the *Railroad Gazette* of Oct. 4, page 664, which has been the subject of prolonged controversy. A settlement was effected Oct. 24, at a joint session of the State Board of Public Works and the Canal commission. The entire property was leased to the road at an annual rental of 6 per cent. on a valuation of $157,000, with the recommendation on the part of the State boards that at the coming session of the Legislature the property be sold outright to the Pennsylvania Company at that figure, with the reservation, however, of the present water way under the street now operated by the State, and the sewer used by the city. Canal Commissioner Rownd, however, would not agree to such settlement and held out to the last for the original appraisement of $357,000, and would not sign the agreement ore the lease, which is for a term of 15 years. The road also gets the canal basin at Hamilton, O., which it had been occupying at $30,000 valuation and 6 per cent. rental.

Savannah & Atlantic.—This road, known as the Tybee branch of the Central of Georgia, extending from Savannah to Tybee, a distance of 18 miles, was sold at Savannah on Nov. 2, under decree of Court for $250,000. It was purchased by Judge W. D. Harden, for the Reorganization Committee of the Central of Georgia, with which it will be incorporated.

Southern.—Active preparations are to be made for running trains over the new route from Greensboro, N. C., via Raleigh, to Norforlk, Va., and it is stated that the service will be in operation in about five weeks from this time. The road between the points named has been reballasted, and the new heavy rails will be put down in a short time. The company has ordered nine new locomotives for this service, and has also placed an order with the Cramps for a first-class passenger steamship to ply between Pinner's Point, near Norfolk, and Baltimore. The new vessel will be 242 ft. long and 42 ft. beam, and will have accommodation for 100 passengers.

St. Louis & San Francisco.—Judge Adams in the United States Circuit Court, at St. Louis, heard arguments last week on the motion to confirm the master's report recommending that the Receivers continue to operate the four leased lines, the St. Louis, Salem & Arkansas, the Kansas City & Southwestern, known as the "Beaumont Branch," the St. Louis, Kansas & Southwestern, or the "Anthony Branch," and the Kansas Midland. The Receivers asked for directions as to whether they should continue to operate these roads. The report of the master is that none of the leases should be discontinued, even though the leased lines are in themselves unprofitable. To this judgment exceptions are taken by some of the parties in interest.

TRAFFIC.

Traffic Notes.

The meeting of Trunk Line Presidents in New York on Oct. 30 took up the proposed Joint Traffic Association agreement and discussed it all day, but no definite action was taken and another meeting is to be held, probably on Nov. 19.

In the United States District Court at Pittsburgh, Pa., James Means, Division Freight Agent of the Pennsylvania lines, has been fined $500 for violation of the interstate commerce law, and C. S. Wight, General Freight Agent of the Pittsburgh Division and Western lines of the Baltimore & Ohio, has been fined $1,000 for a similar offense. Mr. Wight's case will be appealed to the Supreme Court.

Chicago Traffic Matters.

CHICAGO, Nov. 6, 1895.

The Chicago Board of Trade became alarmed last week at a rumor that the Central Traffic and Trunk lines were intending to advance the grain rate from Chicago to New York from 20 to 25 cents and has formally made protest against such action.

The Great Northern has reduced freight rates about 25 per cent. from Central Traffic territory to North Pacific coast points.

The Western lines have agreed to continue their pass agreement for another year, and have reaffirmed it with some slight modifications.

The initial trip of the Atchison, Topeka & Santa Fe's California Limited was made exactly on schedule time. The first train was on exhibition at the Dearborn street station, Chicago, for several hours. Sixty-nine through passengers were carried on it. The equipment consists of 10 new Pullman sleeping cars, 8 dining cars, 8 chair cars 8 express and baggage, and 4 compartment sleeping cars. Fred Harvey, who runs the Santa Fe eating houses, is to manage the dining car service. It is reported that the Vanderbilt system as well as the Erie intends to rearrange its schedule so as to make close connections with the new train at Chicago, making the time from New York to Los Angeles 95 hours, or practically 4 days.

The Chicago & Northwestern announces that its new fast transcontinental train will leave Chicago at 6 p. m., and arrive in San Francisco at 7:45 p. m. of the fourth day, thus saving a whole night on the road. The distance is 2,357 miles, and to make this time (75¾ hours) the speed will have to be 31.1 miles an hour, which is faster than the rate of the new Atchison train, but slower than that of the Sunset Limited.

The Western freight agents, with the help of the executive officers, were partially successful in resurrecting the old agreement of the Western Trunk lines at St. Louis last week, but the objections of the Kansas City, Fort Scott & Memphis to signing any agreement which provides for a physical division of tonnage prevented the consummation of any agreement covering the whole territory. It developed at the meeting that several of the lines, while quite willing to vote for a restoration of rates, were unwilling to tie themselves up by any association agreement. It was then decided to take up the question of making territorial agreements and placing the business in charge of local committees; and agreements were made for apportioning the traffic between Chicago and St. Paul; St. Louis and St. Paul; and westbound traffic to Sioux City and Omaha. Another meeting convened at Excelsior Springs, Mo., Nov. 5, to consider the question of eastbound divisions from Omaha and again try to agree to divisions through Kansas City.

The Kansas City, Fort Scott & Memphis claims that it has always suffered in previous agreements, and consequently declines to sign any new agreement until conditions are changed. The other lines are forced to admit the reasonableness of this position, but apparently are not ready to go ahead and perfect an ironclad association. Following this meeting, a meeting of executive officers of the Colorado lines was held, and it was agreed to advance rates, Nov. 17, between Missouri River and Colorado common points to the basis of 1.25, first-class; rates from Chicago, Peoria, Mississippi River, St. Paul and common points to be made by adding locals, and present commodity rates to remain in effect. A basis for the division of the traffic is to be figured out by the traffic officials, to be made effective not later than Jan. 1, and to continue until Jan. 1, 1897, and thereafter subject to 30 days' notice; rates to be absolutely maintained upon the agreed basis unless changed by agreement, and the established proportions not to be exceeded by any line. It was also resolved not to issue any free or reduced transportation on account of freight traffic.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines for the week ending Nov. 2, amounted to 83,081 tons against 82,220 tons during the preceding week, an increase of 861 tons, and against 46,876 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	Week to Nov. 2.		Week to Oct. 26.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central	12,452	15.0	10,328	12.6
Wabash	7,162	8.7	7,201	8.8
Lake Shore & Mich. South.	12,328	14.8	14,427	17.6
Pitts., Ft. Wayne & Chicago	8,481	10.2	8,657	10.5
Pitts., Cin., Chi. & St. Louis.	8,773	10.6	8,825	10 7
Baltimore & Ohio	4,267	5.1	4,784	5.8
Chicago & Grand Trunk	5,773	7.1	7,060	8.6
New York, Chic. & St. Louis	6,206	7.5	7,936	9.7
Chicago & Erie	13,399	16.1	9,477	11.5
C., C., C. & St. Louis	4,000	4.9	3,525	4.2
Total	83,081	100.0	82,220	100.0

Of the above shipments 3,127 tons were flour, 43,195 tons grain and mill stuff, 13,675 tons cured meats, 10,525 tons dressed beef, 3,990 tons butter, 1,618 tons hides, and 4,252 tons lumber. The three Vanderbilt lines carried 73.8 per cent.; the two Pennsylvania lines 20.8 per cent.